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MANCHESTER MEDICAL SOCIETY

ELEMENTS

OF

PATHOLOGY AND THERAPEUTICS,

BEING THE

OUTLINES OF A WORK,

INTENDED TO ASCERTAIN THE

NATURE, CAUSES, AND MOST EFFICACIOUS MODES OF PREVENTION AND CURE, OF THE GREATER NUMBER OF THE DISEASES INCIDENTAL TO THE HUMAN FRAME;

ILLUSTRATED BY NUMEROUS CASES AND DISSECTIONS.

BY

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VOL. I.

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SECOND EDITION.

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WORCESTER MEDICAL SOCIETY

PREFACE.

THE author of the following work has long been in the habit of recording such facts, connected with the profession of medicine, as have occurred to his own observation, and have appeared to him calculated to amend received errors, or to suggest new truths. These facts it has been his intention to arrange, as soon as a sufficient number should be collected to admit of being disposed in a distinct and consistent form. The immediate exigencies of his profession have, however, so retarded the accomplishment of this design, that he every day sees announced as novelties, opinions, which for thirty years have formed the basis of his practice.

If, however, this anticipation may have occasioned him some loss of credit, it has been fully compensated by the advantage,

which the delay has afforded, of scrutinizing specious hypotheses, and correcting hasty misconceptions.

Sufficient time has now been allowed for all the purposes of observation, which the author can reasonably expect to accomplish during what may remain to him of physical and mental capacity; and he thinks that he cannot employ his leisure better, than in giving an epitome of his pathological and practical principles; reserving the recital of the very numerous cases and dissections, which are the proofs of those principles, for a much larger work, which he has long meditated, and which he still hopes that he may one day be able to accomplish.

If, however, it shall please Providence to frustrate that hope, the author has great satisfaction in leaving his materials in the hands of a person, deservedly most dear to him, of whom it may be permitted him to assert, that his talents, as well as general and professional knowledge, render him fully competent to the execution of that task.

The author thinks it necessary to observe, that his principles are altogether derived from phænomena or facts, cognizable by the senses,

and arranged in their natural order. Conceiving this to be the only mode of investigating, and arriving at truth, he utterly, and for ever, disclaims all reliance on the neurological systems of pathology hitherto extant. He considers them as founded on principles, which are either visionary or inapplicable, and which lead to practices, tending equally to debase the moral character of mankind, to produce, or perpetuate, disease, and to discredit the medical profession.

As the great and ultimate end of pathology is its application to practice, it is by this criterion alone that the value of any pathological system ought to be estimated.

The situation, in which the author has been placed during nearly forty years, has afforded him peculiar opportunities, not only of observing and noting the histories of diseases, but of comparing the results of different modes of medical treatment. As, therefore, his principles have not been adopted without long and patient investigation, so he has reason to hope, that his therapeutics will be found to grow naturally out of his pathology; and that no person, who, with due accuracy and persever-

ance, makes this work the rule of his practice, will be ultimately disappointed in the expectations of success, which he may be led to form from its perusal.

It is proper to remark, that, by the term Disease, is understood such a deviation from the usual state of any part, parts, or the whole of the system, as, when of a certain extent or duration, is productive of more or less of present inconvenience.

So, also, by the general term Excessive, is meant such an increased degree of any natural action or affection, as either accompanies, or tends to produce, the state just described.

Lastly, the term Casual merely implies an ignorance of the efficient or final cause of certain affections or actions.

The asterisks, annexed to some of the Roman numerals which mark the sections, are employed merely to save an entirely new numeration, where sections have been introduced after the completion of other parts of the manuscript.

Bath, July 6, 1815.

PREFACE

TO THE SECOND EDITION.

A Second Edition of the Elements of Pathology has long been expected. This work is again offered to the public, nearly in its original form. Of the proposed Second Volume, a very small portion was completed, and the concluding page of an imperfect, but interesting inquiry, was written on the day which preceded the Author's lamented, and ultimately fatal, indisposition. This fragment, in its uncorrected state, is given as an Appendix to the present Edition.

Previously to the communication of much additional matter which is in his possession, the Editor has thought it an act of justice, to endeavour to illustrate some of the principles and opinions advanced in this work, and in the "Experimental Inquiry," by a comparison

with those which have been attributed to their Author, in the writings of various Commentators, who profess to understand and criticize his doctrines.

This attempt has been made in a Preface, and certain introductory Chapters, which will precede the Collections from the Author's unpublished Manuscripts, and which, while they generally investigate the points at issue, have a more particular reference to the subjects of Vascular Irritability, Inflammation, Determination of Blood, and Nervous Diseases.

In the "Collections," however incomplete, and however inadequately they may represent the extensive work for which they were prepared, will be found the best defence of the Author's system, and the most satisfactory commentary on his doctrines.

Of the character of these Miscellanies, and the grounds upon which their selection and arrangement has proceeded, the Editor has given an account in the prefatory notice, to which he has already alluded.

Bath, Jan. 1, 1825.

MANCHESTER MEDICAL SOCIETY.

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GENERAL PATHOLOGY.

The Nature of Human Science.

(I.)

ALL human science is a knowledge of the qualities and order of Phænomena.

(II.)

Phænomena may be divided into two classes, single and complex.

(III.)

Of the former are the simple Sensations, as a colour, a smell, a sound, &c.

(IV.)

The latter unite, by apparent propinquity, two or more simple Sensations, as derived through one or more senses. Such are gold, an apple, &c.

(V.)

The pictures or recollections of sensations are Ideas; which may be termed Phænomena equally with the sensations which were their prototypes.

(VI.)

The uniform and inconvertible succession of like phænomena constitutes what is called Cause and Effect.

(VII.)

The faculty of distinguishing the agreements and differences of phænomena, both as to quality and order, which is necessarily innate, is the whole of human Intuition.

(VIII.)

When, in a great variety of instances, we have observed a like union, or a like succession, of like phænomena, without having been able to discover any exception to this arrangement; if in other cases we see the same congeries or succession, with the exception of only a small number of phænomena, we infer the existence of those which are unseen. This is the true nature of Induction, which is admitted as an adequate basis of rational conclusion.

(IX.)

A less complete perception of the resemblance of phænomena, or a deficiency as to their number, constitutes Probability; on which we are too often obliged

to rest in philosophical inquiries, and even in the most important practical concerns.

(X.)

The science of Medicine, in its most comprehensive sense, is a knowledge of the qualities and order of such phænomena of animal bodies, as constitute health and disease, together with the conditions necessary to the preservation of the former, and the removal of the latter.

(XI.)

The science of animal Anatomy is the knowledge of such phænomena, as constitute the structure of the animal body.

(XII.)

The science of animal Physiology is a knowledge of the qualities and order of the phænomena of the body in a state of health.

(XIII.)

The science of Pathology is a similar knowledge of the animal body, in the state of disease or death.

(XIV.)

The science of Therapeutics is a knowledge of the quality and order of those phænomena of the animal body, which follow the application of extraneous causes, and precede the restoration of health.

(XV.)

Of all the deviations from health incidental to the animal frame, the most obvious is a disordered state of the whole, or some part, of the Sanguiferous System.

(XVI.)

As the two most observable circumstances with regard to the blood circulating in that system are its quantity and velocity, so the more palpable deviations from the healthy state of the Sanguiferous System consist in some excess or defect of one or both of these two circumstances, the quantity or velocity of the blood.

(XVII.)

I omit here all minute consideration of the quality of the circulating fluid; because neither chemistry, nor any other mode of observation, has hitherto given us much precise information of its different states, as connected in the relation of causes, with any specific phænomena of the animal frame. Where any such connection is probable, it will be noticed as we proceed.

(XVIII.)

The different degrees of velocity in the general motion of the blood are sufficiently apparent from the variation of quickness in the systole and diastole of the heart, and from the flow of blood from punctured arteries or veins.

(XIX.)

It may also be, for the present, assumed, that, the general velocity of the blood remaining the same, that which circulates through particular parts may be retarded or accelerated beyond the rate of motion in the rest of the system.

(XX.)

So also with regard to quantity; the blood may be, first, either in excess or defect in the whole system; or secondly, it may be in excess or defect in one part of the system, while it is in due quantity in the rest; or thirdly, it may be in defect in one part, while it is in excess in the rest; or lastly, it may be in excess in one part of the system, while it is defective in another part, and even in the whole of the rest of the system.

(XXI.)

It is easy to see how these two different circumstances of quantity and velocity may be combined and modified, so as to constitute an excessive or defective momentum of the blood in the whole system, or in particular parts. An excess in this respect is reasonably inferred from a quick action of the heart, in conjunction with preternatural fulness of the arterial, capillary, and venous systems.

(XXII.)

It is also probable, that, the general momentum of blood remaining the same, that of certain parts may

be augmented beyond what exists in the rest of the system, or is consistent with a healthy state of the parts.

(XXIII.)

It will readily be admitted, that all the habits of mankind in civilized society, comparatively with a state of ruder nature, tend to produce an excessive degree of nutrition, and to maintain a proportionable degree of plethora in the human frame.

(XXIV.)

This fact affords a presumption as to the prevailing condition of the sanguiferous system in persons under circumstances of moderate affluence ; which presumption, taken in connection with more direct proofs of the actually existing state, will contribute to confirm and establish the principle.

(XXV.)

If, in consequence of violent exercise, certain states of fever, &c. the general momentum of blood in the sanguiferous system is preternaturally increased, the general heat of the surface of the body is, within certain limits, proportionably augmented.

(XXVI.)

That which occurs with regard to the whole body, is also true of any individual part ; an increased afflux of blood to which, usually, within certain limits, increases its heat. This is evident in the example of blushing, and on several other occasions.

(XXVII.)

These positions must, however, be taken with limitation, since they apply chiefly to the surface of the body; in which also the heat, probably, little, or perhaps not at all, exceeds that which is natural to certain central parts of the body in perfect health.

(XXVIII.)

Were, therefore, the sensible heat of the animal body generated in a central space, and merely diffused by means of the circulating blood, it would follow that, other things being equal, the heat would be in the direct proportion of the momentum of the blood circulating through it. Since, however, it may be that every part of the living frame may have the faculty of evolving sensible caloric, and we are hitherto ignorant of all the circumstances in which that faculty consists, we must, so far, consider the heat of a part only as a presumption, and not a positive proof, of the momentum of blood in its vessels.

(XXIX.)

The presumption will, however, not be invalidated, if, without supposing heat to be diffused by the circulation, we admit that blood is the pabulum, from which, as it circulates through the capillaries or elsewhere, caloric is sensibly evolved ; by whatever power that evolution may be effected.

(XXX.)

Among the different substances which compose the

bulk of the human body, the only one of a red colour is the blood. Accordingly we find that, other things being equal, the greater the quantity of blood in a part at any given time, the redder the part becomes. Hence the increased redness of the skin from bodily exercise, external heat, and various other causes.

(XXXI.)

Hence we may also conversely infer, that, other things being equal, the relative quantity of blood existing in a part is directly as its redness.

(XXXII.)

This rule will apply not only to tints, which are scarlet or of a bright crimson; but also, under certain circumstances, to those which are of different shades of purple, reaching to that of the damson.

(XXXIII.)

These different tints usually keep pace with the change of the blood from arterial to venous; the former being of a bright crimson approaching to scarlet, the latter of a deep crimson or purple, approaching to blackness.

(XXXIV.)

This change from darkness to brightness, in the living and healthy body, is chiefly, if not wholly, produced either by the respiration, or by a process similar to the respiration, of air, of which a certain proportion must be oxygen gas.

(XXXV.)

The colour of a part, as to intensity and shade, is doubtless modified not only by that of the blood circulating in it, but also by the circumstances of the substance, which is interposed between the blood and the eye of the observer.

(XXXVI.)

Still, however, there is a general relation between the external appearance of a part, and the colour of its circulating blood; so that, other circumstances being given, the more purple colour is, for the most part, the evidence of venous blood, and the brighter crimson tint, as far as the damask, is a proof of the predominance of arterial blood.

(XXXVII.)

As, however, venous blood not only obtains the florid colour of arterial blood by exposure to an unusual influence of oxygen gas on it, while circulating in the vessels, under certain circumstances of accelerated respiration, but preserves or acquires that colour in certain states of excessive momentum; so, on the other hand, arterial blood is capable of becoming dark in the vessels, under certain states of defective respiration, or of mere stagnation.

(XXXVIII.)

On the whole it is probable, that although redness, or a purple even to blackness, is an evidence of fulness of blood, it is only florid redness, in its different

shades, that, taken by itself, can be considered as a tolerably decisive proof of increased momentum, except in cases of defective respiration on one hand, or of preternaturally quick respiration on the other.

(XXXIX.)

The conclusion as to excessive momentum from colour will, however, derive additional strength from the coincidence of increased heat before mentioned.

(XL.)

It may be objected, that, after violent hæmorrhages, the upper extremities, though very pale, are often preternaturally hot. As, however, in such cases, the pulse is extremely quick, often reaching from 120 to 140 in a minute, and at the same time the blood in the radial artery is strongly impelled at every systole of the heart, it is probable that more blood circulates through these pale extremities in a given time than in a state of health; and therefore it may reasonably be expected that more sensible calorie will be evolved.

(XLI.)

We can readily distinguish by the touch, and often even by the eye, the fulness and distention of an artery, or the prominence of a subcutaneous vein, from the smallness and contraction, and therefore comparative bloodlessness of the same artery or vein. We find also that not only the diameter of a single artery or vein, but also the bulk of an entire part

itself, is capable of being influenced by the quantity of blood severally existing in them at a given time.

(XLII.)

The conclusion as to the existence of increased momentum will therefore have all the certainty which our present knowledge will admit, if, without any proof of extravasation, and under the circumstances of equal quickness in the pulse, and of preternatural florid redness and heat, a part shall be of larger volume than natural; more especially, if the arteries leading to the part, and the veins passing from it, shall, either by the touch or eye, be perceived to be preternaturally distended.

(XLIII.)

Other changes arising from increased fulness or momentum will hereafter be pointed out, and, if proved, will, in their turn, furnish evidence of the existence of the cause, where it is not otherwise observable; just as if we see that fire produces smoke, we are disposed, when we see smoke, to infer the existence of fire.

(XLIV.)

Even the effects of the curative means themselves may, under certain circumstances, afford proof of the state of circulation. But this proof must be admitted with the greatest caution; and never until the *modus operandi* of the measure shall have been demonstrated by the most legitimate processes of inference; that

is, by an accurate observation of a like order of phænomena in like circumstances.

(XLV.)

The quantity of blood in the whole system remaining the same, it is obvious, that if, by any cause, that naturally existing in one part is diminished, there must be a proportionable increase in some other part, or in the whole of the rest of the system.

(XLVI.)

Under like velocities, the same rule will hold good with regard to the momentum of the blood; which, if diminished in one part, must be proportionably increased in some other, or the whole remainder of the system.

(XLVII.)

If the two last propositions are true, there is no reason to doubt that the converse of them is true also.

(XLVIII.)

Into the anatomical structure of the Sanguiferous System, or the powers by which the Circulation of the blood in man is accomplished, it is not my purpose minutely to inquire in this place. It will be sufficient for me to point out here the more obvious phænomena, which constitute that important function.

(XLIX.)

The coats of arteries very evidently possess two powers of motion.

(L.)

The first is the mere mechanical faculty of Elasticity; in consequence of which when the artery is preternaturally distended or elongated, it returns to its natural state, as soon as the counteracting power is removed. This faculty is exerted, also, when the artery is either compressed, or the usual position is forcibly changed; in consequence of which it exhibits a tendency to the restoration of the natural tubular structure, and line of direction.

(LI.)

Another power attached to the coats of arteries resembles in some degree that which exists in muscular fibres. We see that, during life and health, the arteries always accommodate themselves to the quantity of blood which they contain, so as, strictly speaking, to be continually full; and if in consequence of a ligature, or various other circumstances, an artery no longer serves as a channel for the blood, it gradually contracts itself, so as to become an impervious cord.

(LII.)

This power, which exists in arteries of considerable size, and which by Bichât is called *Contractilité par défaut d'extension*, (Contractility through defect of

extension,) he considers as being a property of dead matter.*

(LIII.)

As however, it is evident that the degree of contraction specified in (LI.) occurs only during life, the power by which it is effected must be considered as a vital one; which indeed BICHÂT himself, by a strange inconsistency, virtually admits, when he says that, "*il reçoit bien des forces vitales une accroisse-*" *ment d' energie.*"†

(LIV.)

This power being in some respects similar to the Tonic power of muscles, which seems to be the result neither of the will, nor of any other known artificial stimulus, I shall, notwithstanding the distinction made by BICHÂT, give it the name of Tonicity.

(LV.)

Mr. HUNTER, and others, have attempted to shew that tonicity in arteries resides in the coat immediately without the thin internal coat; and they conceive the coat possessing that quality to have muscular fibres. In the first opinion these philosophers were probably right. In the second they have failed, and have given themselves unnecessary trouble. To infer that, because muscular fibres, where visible, have an inherent capacity of motion, therefore all parts which

* Recherches sur la Vie et la Mort, page 100.

† Ibid. p. 101.

have that power have fibres, though no muscular fibres are discernible in them, is in the highest degree rash and assuming. In the Polypi, and various Zoophytes, no such structure is perceivable; and yet these animals take food, and perform all the movements suited to their several stations in the scale of nature. It is to be feared, also, that the Sphincter Iridis in the human eye, alluded to by the eminent physiologist whom I have quoted, has no real existence.

(LVI.)

It is indeed a curious fact, that the substance called Fibrine, which is uniformly found to form a part of muscles, and even of animal intestine, which has muscular powers, has no existence, according to BERZELIUS, in the coats of arteries; which affords a strong presumption that they are void of the functions of muscles.

(LVII.)

As, however, a power of motion, to which I affix the name of tonicity, does exist in arteries during life; so it is probable that this power, like that of muscular fibres, continues for a short time after what is commonly called the death of an animal.

(LVIII.)

BICHÂT agrees with HUNTER in the admission, that, in the larger arteries, the mechanical power of contraction greatly exceeds the vital power, and that this proportion is gradually reversed, as we proceed

from the heart; so that, in the Capillaries, the vital power, or tonicity alone, is perceivable. Nevertheless, the capacity of contraction, which I have before remarked as being a power of life, justifies us in so far arranging the larger with the capillary arteries.

(LVIII.*)

The most obvious cause of the motion of the blood is the Heart, and I cannot, either from the phænomena with which I am acquainted, or from any of the arguments of certain physiologists, see any reason to disagree with HALLER, who concludes that, in a state of health in animals like man, the force of the heart is adequate to the task of carrying on the march of the blood through its entire circulation. It is, indeed, sufficiently obvious that any alternate contractile power, like that of muscular fibres, in the arterial system, beyond that which implies a mere state of accommodation to the column of blood actually impelled into any part of it by the *vis a tergo*, would just as much tend to impede the ingress of a new quantity of blood, as to promote the egress of that already existing in it; and, therefore, could in no degree assist the circulation.

(LIX.)

What powers, besides that of the heart, may assist the circulation of the blood in some orders of animals, or wholly produce it, without any aid from a heart, in others, and in Akerious Fœtuses, I need not at present inquire; for if, in these instances, the circu-

lation is carried on by any central force, of whatever description, the apparatus, in which that force resides, is to all intents and purposes a heart.

(LX.)

When, however, a projectile force has once been given to the blood from the impulse of the heart, or of any central part so constructed as to answer the purpose of a heart, we may readily conceive how the usual progressive motion may for some time continue, after the action of the heart has either ceased, or, at least, has been interrupted with regard to the part.

(LXI.)

To this cause we may, perhaps, in part, attribute not only certain microscopic phænomena observed in the circulation of the blood by HALLER and SPALLANZANI, but also this remarkable fact, that, after death, all the arteries, whether large or small, are found comparatively void of blood.

(LXII.)

Although, however, this may be, in part, the cause of the emptiness of the arterial system after death, it is probably only a small part.

(LXIII.)

It is more reasonable to conjecture that, in health, arteries are capable of being contracted by their tonicity beyond that degree which would be permitted by their elasticity; but that, after death, the tonicity

being shortly lost, the mechanical power of elasticity preponderates, and the artery no longer contracts in proportion to the blood which it contains, and is consequently more or less empty.

(LXIV.)

Whether this explication of the phænomena be or be not admitted, it is obvious that, on various occasions during life, certain vessels become unusually distended with blood, not only from an excess of impulse by the heart, but even when that impulse can not be perceived to go beyond the natural and healthy degree. Thus, shame fills the cutaneous arteries of the face and neck; sexual desire the vessels of the procreative organs; &c. &c.: and as these causes act primarily on functions which are peculiar to animal life, it is obvious, that the ultimate affections are also of an animal, and consequently a vital, nature.

(LXV.)

Thus, every step that we proceed in the investigation of the phænomena, we see additional reason to infer the existence of a living power in arteries, to which I have appropriated the name Tonicity; and with regard to which it is of little consequence, whether it resides in one texture with different actions or affections, or in several textures. Farther evidence of the general principle will occur as we advance.

(LXVI.)

The capacity of increased dilatation of arteries, and consequent local fulness, independently of increased action of the heart, is proved by many facts besides those to which I have last alluded. Let a grain of sand enter the eye, and almost immediately we perceive an increased fulness of blood in a large proportion of the vessels of the Conjunctiva, and an influx of red globules into those, in which they were not before visible. The local application of certain degrees of excessive heat produces similar effects upon various vascular parts; and like consequences occur from the application of other substances, which are called Stimuli, and which are found to have the power of causing sudden contraction in muscular fibres, which they are made to touch. To these may be added the increased afflux of blood to the subcutaneous vessels of the face and neck from shame, already mentioned; the dilatation of the papillæ and genital system from mental and bodily causes, together with other examples, which will be hereafter enumerated, and which will not only prove the general principle, but tend to shew the specific effects of particular causes on appropriate parts of the sanguiferous system.

(LXVII.)

As heat, locally applied, fills in an extraordinary degree certain vessels, so, on the contrary, an unusual abstraction of it, or what is commonly called the application of cold, has an opposite effect; causing

vessels to contain less blood, and consequently, the part to become pale, and to shrink. This effect occurs not only with regard to the capillary arteries, but the branches also, from which these ramuscules are supplied.

(LXVIII.)

A similar effect is sometimes produced on the sanguiferous system of the extremities and skin by certain mental affections, as fear, horror, aversion, and pain; and by all those causes which give rise to the cold fit of fevers.

(LXIX.)

It is one of the most important phænomena of the animal frame, that after vessels have thus been more or less robbed of their blood, by the causes above specified, and many others, there often succeeds a contrary state, in which the vessels so robbed become unusually distended with blood, and the part, in consequence, preternaturally large, red, and hot,—a series of phænomena very generally characterized by the term Reaction.

(LXX.)

This state of unusual fulness, or momentum, often occurs without any observable change in the action of the heart, and therefore depends on certain properties of the vessels themselves, altogether inexplicable but on the principles of vitality.

(LXXI.)

As on the application of the stimulus of light to a healthy retina and brain, the radiated fibres of the Iris are observed, contrary to the usual properties of muscular fibres, to lengthen, instead of being shortened, and therefore to diminish the diameter of the pupil; it has been thought that the living coat of the smaller arteries may possess a similar power, and that this power may be called into action by the various causes before mentioned. The hypothesis has not, hitherto, been proved by any direct evidence. Mr. HUNTER asserts that the morbid dilatation can go beyond that which is produced by the elasticity of the artery.

(LXXII.)

After this preternatural fulness of certain vessels has occurred, from whatever cause, independent of the action of the heart, it again, under certain circumstances, disappears; the vessels assuming their usual state of contraction.

(LXXIII.)

If, however, vessels are subject to undergo the changes above stated from causes acting immediately on themselves, they are still more liable to them through the medium of the action of the heart.

(LXXIV.)

The power of the heart is evidently a vital one, producing on its contained blood a mechanical

effect, like that from a pair of bellows on the air within it.

(LXXV.)

It is well known, that in man, and various other animals, the heart consists of four bags united together; of which two are left, or somewhat posterior; and two are right, or somewhat anterior.

(LXXVI.)

On the right, or anterior side, the Auricle receives nearly all the blood from the veins through those large trunks called the Superior and Inferior Cavæ. Between this Auricle and the Ventricle on the same side there are interposed Valves, called from their shape Tricuspid, which open towards that ventricle.

(LXXVII.)

From the right ventricle arises the Pulmonary Artery, having at its origin Semilunar Valves, opening in the direction of the artery. Through this artery the blood of the right side of the heart passes into the Lungs.

(LXXVIII.)

On the left or posterior side of the heart, the blood, returning from the lungs, and being collected into those large trunks called Pulmonary Veins, is received into the left auricle; between which and the ventricle of the same side, are placed the Mitral Valves, opening towards the ventricle.

(LXXIX.)

From this ventricle springs the Aorta, furnished at its rise with Semilunar Valves, opening forwards into the Artery.

(LXXX.)

The tricuspid and mitral valves, at their greater circumference or roots, are firmly attached all round to the substance of the heart. Their opposite extremities, or apices, are however to a certain degree loose, or capable of moving; but so drawn down towards the point of each ventricle by tendinous cords, attached at one end to the apices themselves, and, at the other, to certain elongations of the muscular substance of the ventricle, that when the ventricle is in a state of mean expansion and elongation, called its Diastole, these valves lie flat downwards against the circumference of the ventricle.

(LXXXI.)

When, however, in consequence of the Systole of the auricle, the blood is expelled from it into the ventricle, the muscular substance of the latter is contracted and shortened; and the mitral valves, no longer drawn forwards by the tendinous cords, become loose. At the same time the blood, being compressed on all sides, acts against these valves, so as to close them in the center. Hence the chief part of that blood, which was in the ventricle, is transferred to the aorta, and gives a new impulse onwards through the whole sanguiferous system. This

process, in consequence of a nearly similar structure, occurs at the same time on both sides of the heart.

(LXXXII.)

The effect of these Cordæ Tendineæ and Carneæ Columnæ is not merely to retract the tricuspid and mitral valves during the diastole of each ventricle, so as to allow free course to the advancing blood; but also to prevent the loose apices of the valves from being forced back and inverted into the auricle, by the blood, compressed by the contraction of the ventricle during its systole.

(LXXXIII.)

In the aorta and pulmonary artery, the semilunar valves meet in the middle by the resistance of the column of blood in the respective artery when the systole of the ventricle has ceased; in consequence of which, and perhaps of the diastole of the ventricle itself, some tendency to a retrograde motion of the blood taking place, the valves are fully erected, and tend to shut up the whole area of the artery.

(LXXXIV.)

The contractile power of the artery being little more than that of elasticity, aided by some weak muscular fibres, it is evident that no such apparatus as that of tendinous cords attached to muscular columns is necessary to prevent the inversion of the semilunar valves, after the systole of the respective ventricle has ceased.

(LXXXV.)

It seems, indeed, to be admitted among the more modern anatomists, not only that the ventricles do not completely empty themselves at each systole; but that, in consequence of the want of muscular power in the great arterial trunks, it is unnecessary that the area of these trunks should be accurately closed during the diastole of the ventricles.

(LXXXVI.)

From observation on living animals, it appears that the systoles or contractions of the auricles are synchronous; and that they alternate with those of the ventricles, which are also synchronous.

(LXXXVII.)

It is scarcely necessary to add, that the Pulse, or supposed diastole of the arteries, is synchronous with the systole of the ventricles.

(LXXXVIII.)

Why, for the purpose of carrying on the circulation, the venæ cavæ and pulmonary veins are not furnished with valves opening into the auricles, it is not easy to shew. Perhaps, however, this want may arise from the considerable muscular contractility of the terminations of these veins themselves, which, in addition to the natural progress of their blood, may sufficiently resist the tendency to regurgitation of the blood from the auricle during its systole. Some regurgitation does indeed probably always take place;

which may be one of the reasons why the capacity and extensibility of the auricle are greater than those of the corresponding ventricle, in order that it may contain more blood than is necessary for the immediate purposes of progressive circulation.

(LXXXIX.)

We may indeed see why, on the contrary, valves at the termination of the cavæ might be injurious, by preventing the right auricle from discharging part of its blood in a retrograde direction, as it now usually does, when congestion accidentally occurs in the vessels of the lungs, and consequent resistance to the free evacuation of the right ventricle takes place. It is not, however, very apparent in what respect valves would be injurious at the termination of the pulmonary veins; unless we may conclude that congestions of blood in the left side of the heart would be more dangerous than in the lungs.

(XC.)

The greater part of the blood received into the right auricle, and from thence propelled into the right ventricle, is, by the contraction of that ventricle, driven forwards through the lungs; whence it returns, collected into the pulmonary veins, in four trunks, into the left auricle.

(XCI.)

This may be considered as nearly an entire circulation, in which the blood, of a dark colour as it came

from the veins, acquires, by the influence of vital air in respiration, a florid redness; which, as we have before seen, is the common characteristic of arterial blood.

(XCII.)

In this state it passes successively to the left ventricle, aorta, and capillaries; and from thence into the veins, and back into the right auricle, as before stated. This is the second or greater common circulation.

(XCIII.)

A third circulation is confined to the substance of the heart only. It is performed by the two Coronary Arteries, which arise from the aorta just without the semilunar valves, and return their blood, by the coronary veins, directly into the right auricle.

(XCIV.)

The arteries and veins being in a state of health always full, and the blood being to all intents and purposes incompressible, that fluid may be considered as if it formed a continuous solid column all the way onwards from the mitral to the tricuspid valves. Hence at every systole or contraction of the left ventricle of the heart, the shock acts, at the same instant, throughout the entire circle.

(XCV.)

We must not, however, suppose that the arteries and other blood-vessels are dilated by this systole.

The dissection of living animals shews, that, except under peculiar circumstances, these vessels suffer from that systole no perceptible dilatation whatever; the ordinary tangible pulse being nothing more than the effort of a column of blood of a certain diameter to restore the area of a vessel artificially diminished by the pressure of the finger, or any other hard substance.

(XCVI.)

When we speak of the return of the blood from the arteries by the capillaries and veins, it is not intended to assert that the whole blood observes this progress. In all the three circulations a part of the minute ramifications ends in Exhalants and other vessels, intended for the growth and reparation of solid parts, and for the various fluid secretions and excretions, which are essential to the several functions of the animal frame, whether in health or disease.

(XCVII.)

The exertion of these functions themselves affords satisfactory evidence of the tonicity of certain branches of the capillaries, which, though often of equal diameter with others carrying red globules, not only in a state of health refuse to admit them, but select, as it were, what parts of the blood to receive, and what to effuse; and even combine its several molecules, so as to form substances of new and original properties.

(XCVIII.)

That the capacity of rejection, which exists during

health ceases at some period after death, appears from the various exsudations and ecchymoses which we usually see in many depending parts of the dead subject.

(XCIX.)

That it also continues for some time after apparent death, is evident; because the matter of coloured injections, which after many hours freely passes into the colourless exhalants, enters them with difficulty at an early period.

(C.)

It has been usual to compare the circulating distributions of arteries, capillaries, and veins, to Trees, united by their extreme branches; and having their trunks attached to the heart. Thus, in the two greater circulations, the aorta and pulmonary artery are respectively the trunks of the arterial trees, and the capillaries are the extreme branches: and, *è converso*, the minute veins uniting with the capillaries are the extreme branches of the venous trees, of which the venæ cavæ and pulmonary veins are the trunks.

(CI.)

In each of these trees, the diameter of the branches taken together greatly exceeds that of the trunks; and the venous tree is throughout its branches and trunks more capacious than the arterial tree.

(CII.)

I have already quoted the opinion of HALLER, that, in a state of health, the action of the heart is sufficiently strong to carry on the march of the blood through its whole course in an animal like man. BICHÂT himself attributes the circulation through the arteries wholly to that cause. Pursuing, however, the steps of various preceding writers, he considers the capillaries as a system distinct as to its functions ; over the circulation through which, the heart has no controul. That circulation, according to him and his precursors, is accomplished by means of an Oscillation, or intestine motion in the coats of the capillaries, which, acting on the blood within them, contributes also in some degree to the progression of the blood in the veins ; although the completion of the latter process depends on certain active powers in the coats of the veins themselves, and on the influence of various causes of mechanical impulse from without, such as respiration, the beating of the heart and arteries, the pressure arising from muscular motion, &c.

(CIII.)

It would have been well if this ingenious physiologist had explained the *modus operandi* of this oscillation, which, conformably to the analogy of the circulation through the heart, must be a mechanical process, depending on a vital cause ; and, as I have before observed with regard to vessels in general, it would not be easy to shew that any assignable process

of this description would not as much impede the flow of blood into the capillaries, as accelerate its exit, when it had arrived there.

(CIV.)

Satisfactory proofs may, however, be given of the influence of the heart through the utmost extent of the venous system, although in that system the circulation may be aided by the valvular structure, through the medium of the various mechanical causes assigned by BICHÂT, and well known long before his time.

(CV.)

By observations on living warm-blooded animals it is found, that at the roots of the venæ cavæ and pulmonary veins, there is a very strong muscular contractile power, during the exertion of which, or their systole, these portions of the veins are emptied, and the auricles filled. This state, however, implies a strong previous *vis a tergo;* otherwise as much of the blood would be repelled, as was driven forwards into the auricle.*

* It is probable, however, that among the auxiliaries of venous circulation, there is one, which perhaps may have been discussed and abandoned, but which I do not remember to have seen adduced by any late physiological writer. This is the Automatic Diastole of the Auricles ; which, by producing a vacuum in their cavities, must cause the blood in the contiguous large veins, acted on by their own elasticity, and if you please by their muscular power, by the pressure of the surrounding parts, and more remotely by that of the circumambient air, to drive on the blood in order to supply that vacuum. The same principle may assist the passage of the

(CVI.)

But whatever may be the cause of the progression of venous blood, it is certain in fact, that, in a state of health, the average quantity of blood received into the right auricle at each diastole must be at least equal to that evacuated from the left ventricle at each systole.

(CVII.)

From the superior capacity of the venous trunks to that of the arterial ones, we may easily perceive why this balance may be maintained, notwithstanding a slower circulation of the venous than of the arterial blood; for it is evident, that if the quantity of blood be supposed as three, and the velocity as two, the result will be precisely the same as if the quantity were two, and the velocity three.

(CVIII.)

The usual action of the heart is Automatic, or Involuntary. Accordingly we observe it, when recently cut out of the body, contract from the application of various chemical and mechanical stimuli; its contraction being in such cases always followed by relaxation, or a return to its natural state of expansion.

(CIX.)

It is, however, liable to be affected, during life, by various causes. Among these, certain mental

blood from the auricles into the ventricles; the expulsory power of the former always co-operating, in point of time, with the absorbent power of the latter.

affections, operating therefore through the brain, greatly influence its motions; some suddenly increasing their force to a vehement degree; others proportionably diminishing them.

(CX.)

In this way the actions of the heart are, in a degree, and according to common language, Voluntary; for if certain movements of the heart follow certain affections of the mind, and the man has the power of recalling the ideas of those affections, the heart, suffering from those ideas as from their prototypes, may be said to be, on such occasions, under the power of the Will, and its action may so far be called voluntary.

(CXI.)

It were greatly to be wished that we possessed a better history than we actually have, of the effects produced on the heart by affections of the mind.

(CXII.)

Such a history would, however, be attended with great difficulties; not only because those very affections must tend to destroy the capacity for observation in the patient himself, who can be the only accurate historian of his own feelings, but because the effects themselves seem to vary, on different occasions, according to the degree of the cause, and the previous circumstances of the heart itself.

(CXIII.)

Although the heart, when taken out of the body, will for a time suffer the alternate states of contraction and relaxation; yet from the experiments of HALLER it appears, that its action very quickly ceases without some extraneous stimulus.

(CXIV.)

The experiments of the same author shew that its contractions are more readily, and through a longer space of time, excitable by stimuli applied to its internal than its external surface.

(CXV.)

As among the exciting causes of its contractions, in common with those of other muscular fibres, is simple impulse, we cannot but consider the blood itself, even in a mechanical view, to be a powerful cause of the systoles, or contractions of the heart. We may also conclude that by its warmth, and by certain other properties of vitality, the blood is better calculated for the accomplishment and uniform maintenance of this purpose, than any other power.

(CXVI.)

These various positions are easily enough proved by the effects, on healthy animals, of different degrees of evacuation of blood in occasioning weaker action of the heart, or even temporary cessation of its motion; by the substitution of any other fluid; and by the

introduction of certain poisonous substances into the circulation.

(CXVII.)

The quantity of blood existing in a living human body must much vary, according to the circumstances of magnitude and health of the subject. In an adult person of middle size, and in a healthy state, it has been estimated at between 20 and 30 pounds avoirdupois; but the quantity doubtless differs at different times even in the same person, as evidently appears from all those circumstances of distention of the vascular system, which indicate its comparative fulness. Such are the degree of redness of the capillaries, the general warmth, the prominence of the veins, and the fulness of pulse in the arteries.

(CXVIII.)

Although a certain quantity of blood is doubtless necessary in order to stimulate the heart to a due performance of all its functions, the quantity in the system is often excessive.

(CXIX.)

The effect of that excess is not always the same; for though the most obvious, and perhaps the first, consequence of accumulation of blood in a healthy heart is to stimulate it to inordinate action, yet there is reason to believe, that, after a certain period, the action arising from that cause is often followed, as in other muscular parts, by proportionable diminution

of the capacity of action; whence may arise syncope, or even death itself.

(CXX.)

On other occasions, the immediate effect of accumulation of blood in the heart seems to be a more sluggish action of that organ. This may be often perceived, when, in full habits, the pulsation of the arteries in general, and that of the Carotids in particular, being frequent and full, a strong pressure is made on one, and more especially on both carotids; in which case the action of the heart will, in many instances, be immediately diminished as to frequency and force. The same thing occurs from the accumulation of blood in the heart, produced by muscular exertion during paroxysms of the Syncope Angens.

(CXXI.)

It is evident, therefore, that the effect of the blood on the action of the heart is not always proportioned to its absolute quantity, but often to the previous circumstances of the heart itself.

(CXXII.)

The degree of the heart's action is not to be estimated merely by the quickness of its motion, or by its strength; but by the two taken together. Excessive blood-letting, or spontaneous hæmorrhage, and other extenuating causes, suddenly applied, will often excite preternatural quickness alone, which will

diminish in proportion as the inanition, and other attendant circumstances, are diminished.

(CXXIII.)

The only obvious local causes of torpor in the heart are certain organic diseases, such as fatness, extenuation or flaccidity of the muscular substance, and ossification of the coronary arteries; the latter of which seems usually to produce the peculiar symptoms of the Syncope Angens.

(CXXIV.)

To these local causes of predisposition to torpor of the heart may be added others, the immediate operation of which is on the Brain. Such is mechanical pressure on the brain. Such also, perhaps, is the influence of certain narcotic poisons, as digitalis and some others; which, if they act primarily on the brain, certainly do not affect the heart through the medium of the organs of respiration.

(CXXV.)

The power of increased fulness of blood in contributing to retard the action of the heart under the states of organic disease before mentioned, seems tolerably well ascertained; and, from the fact stated in (CXX.), it appears that the same effect may arise from certain unknown conditions of vitality in that organ.

(CXXVI.)

How far fulness of blood may affect a heart mor-

bidly disposed from the causes in (CXXIV.) has not, so far as I know, been ascertained by experience.

(CXXVII.)

The contrary state of the heart, or the predisposition to over excitability, appears also to arise from certain states of disease in the heart itself.

(CXXVIII.)

Of these some may be organic, as preternatural enlargement; some acute, but not necessarily permanent, as inflammation, or excessive vascular fulness, of the substance, or internal membrane, of the heart; and some chronic, more especially that which we see perpetually occurring from the defect of due exertion of the voluntary muscles. This predisposition in the heart accompanies that condition of constitution which is usually called Nervous, in which the heart is peculiarly disposed to be affected by the whole train of mental emotions.

(CXXIX.)

In all these cases, muscular exercise, which returns the blood by the veins into the heart with more than usual momentum, excites excessive action in that important organ.

(CXXX.)

These examples are intended, not to form a complete or accurate arrangement, but merely to give a general notion of the power of predisposition in the

heart itself to modify the effects of the blood on that viscus.

(CXXXI.)

Certain other circumstances of the general constitution seem to afford consequences similar to those last described; so that the quantity of blood compatible with the due action of the heart, and the due performance of other vital functions, is in the same person very different at different times, and under different states of health.

(CXXXII.)

Could we, from the circumstances of the heart's action, always with tolerable certainty decide as to the just quantity of blood existing in the whole or certain parts of the frame, great benefits would arise to the human race. But of the insufficiency of the means hitherto generally employed for that purpose, the experience of every candid practitioner affords sufficient proof.

(CXXXIII.)

The criterion, on which we are in the habit of relying for information as to this point, is the pulse of an artery; and it has been customary to seek for this instruction from the radial artery only.

(CXXXIV.)

Now if the principles, which I have hinted at above (XLV.) are well founded, it is obvious that

nothing can be more deceptive than this criterion. Of the truth of these principles, it may be expected that I should give some proofs and illustrations; and this I shall briefly do in this place.

(CXXXV.)

First, In many diseases, the pulse of certain arteries, and, among the rest, of the radial, shall be weak and small, the part being at the same time preternaturally cold; while the pulse of all other tangible arteries shall be excessively full and strong.

Secondly, I have known an instance in which no pulse existed in either radial artery, as long as the patient rested on a deep inspiration; and another in which the pulse in those arteries was lost during seventeen days; while in both these cases the pulse in all the arteries derived from other trunks was of its natural strength.

Thirdly, It is not very uncommon to observe the pulse lost in all the arteries of one arm, while it may be found as usual in those of every other part.

Fourthly, In a state of moderate and perhaps due general fulness, the face and head are, on various occasions, flushed and hot, and the pulse of the carotids is extremely strong, full, and bounding, while all the extremities are cold and pale, and the pulsation of their arteries preternaturally small and weak. This occurs in certain diseases of a highly dangerous kind, as Erysipelas of the face; in which the skin of the whole head shall be extremely hot and full of

blood, and the pulse of the carotids enormously full and strong, while the extremities are of a deathlike coldness, and the pulse in the radial arteries very weak and small.

Fifthly, Again, in various diseases, as Gout and other local inflammations unaccompanied with fever, while the arteries of the part, and those immediately leading to it, shall be full in an unusual degree, no change from the natural state shall be perceivable in the radial arteries. If also the gout, without fever, affects one hand only, the pulse in that radial will be excessively strong, while in the other it is in its usual state.

(CXXXVI.)

If these things are so, surely we ought to wonder at the confidence with which physicians look to the condition of the pulse in the radial arteries as the general evidence of the state of disease, and the chief rule of the administration of remedies.

(CXXXVII.)

On the other hand, the different degrees of afflux of blood to certain parts are so connected with the condition of those parts as to health, and so easily discoverable by the state of their arteries, that, though this state has been hitherto in a great measure overlooked and neglected, it may be considered as affording strong evidence of the existence, seat, nature, and cause of disease.

(CXXXVIII.)

Among the modes in which the blood influences the action of the heart, we may here more directly advert to general muscular exercise, which, by compressing the venous system, compels the blood to pass with unusual rapidity, through the venous valves, into the right auricle; and thus stimulates the heart to contractions extraordinarily quick and forcible.

(CXXXIX.)

To these causes of increased action, namely, mental irritation, and unusual fulness or impulse of blood in the heart, may be added other powers, which, however inexplicable their *modus operandi*, actually produce on the heart a similar effect. Such are, long exposure to heat, late hours, Venus nimia, the causes of fever, and various causes acting on the alimentary canal; among the last of which are highly stimulating ingesta, accumulations of food, fæces, flatus, &c.

(CXXXIX.*)

By which ever of these causes the movements of the heart are increased, it is evident that by them great changes are produced on the circulation of the blood, and on the vessels through which it is effected.

(CXL.)

If the different states of vascular dilatation mentioned in (LXVI.) may arise from local circumstances, such states are still more conspicuously connected with the different degrees of action in

the heart, and the consequent momentum of the blood.

(CXLI.)

That condition, with which alone we are at present concerned, is an excessive momentum of blood; and if any of the causes already specified, such, for example, as the exposure of a part to certain degrees of heat, produce an excessive determination of blood to that part, the determination will be greatly increased, if the application of the cause increases also the action of the heart. The same effect will arise under the operation of whatever other cause; as, for example, in cases of reaction from the local application of cold, (abstraction of caloric,) &c.

(CXLII.)

It has been before remarked, that a certain momentum of blood in the arteries is necessary to their due dilatation, and that without it they contract to impervious cords.

(CXLIII.)

On the other hand, excessive impulse from the heart produces excessive dilatation. This state, which is the converse of the former, and extends to many of the capillaries, as well as the larger arteries, is evident from the full and strong pulsation of all the tangible arteries, and from the redness and general heat of the body, which occur from violent exercise and in certain stages of fever.

(CXLIV.)

The blood being virtually incompressible, and the vessels being, within certain limits, yielding tubes, the resistance of their coats being given, their dilatation will be in the direct proportion of the momentum of the blood impelled into them; and conversely, the momentum of the blood being given, the dilatation of blood vessels will be in direct proportion of their extensibility.

(CXLV.)

With regard therefore to common circulation, these two states, of increased impulse or momentum on one hand, and of diminished resistance on the other, seem to constitute the two primary conditions of preternatural distension of vessels containing blood.

(CXLVI.)

General excessive dilatation, occurring from temporary causes, as muscular exertion, will often cease as the cause ceases, and leave no permanent general or topical effects.

(CXLVII.)

On other occasions, the excessive momentum is succeeded by local determinations, which, from their duration or other circumstances, may be considered as morbid.

(CXLVIII.)

The order of succession of local symptoms of this

kind, as connected with constitutional ones, is varied chiefly in the three following ways:

1st. In some instances the local congestion or dilatation first appears, and is followed by excessive action of the heart, and proportionable general momentum of the blood.

2dly. In other instances, the local and general momentum seem to occur together, and to proceed with equal steps; and,

3dly. In other cases, the general increased momentum precedes, and is followed by the local morbid determination.

(CXLIX.)

It is worthy of being well remembered, that local determinations, following general excessive momentum, do not often occur, till after the latter has lasted for several hours, and sometimes even days. This is a common order of facts in gout and other local inflammations. Other instances of the same kind, not amounting to inflammation, or generally remarked by authors, will be adduced as we proceed.

(CL.)

In the degrees of susceptibility of these various modifications of disease, there is great diversity in different persons.

(CLI.)

Thus one set shall be exposed to violent cold, without experiencing any local or general malady.

(CLII.)

In another set, some increased general or local momentum shall take place, and shew itself by its appropriate symptoms; which will vary both as to their force and period of commencement.

(CLIII.)

Under the circumstances of increased general momentum, even though of considerable duration, some persons shall have no subsequent local undue determination, while the far greater number shall experience some topical malady, evidently connected with the general excess of the momentum of the blood.

(CLIV.)

These variations occurring to different persons, without any apparent difference in the duration and quality of the exciting cause; and more especially affecting, by classes, persons of the same family, or accustomed to live in a similar manner; we are naturally led to presume that they depend upon certain previous tendencies towards these several effects.

(CLV.)

To these tendencies it is customary to give the name of Predisposition, whether they be hereditary and original, dependent on the age, owing to accident, or produced by habits unfavourable to health.

(CLVI.)

We farther observe, that, after exposure to the

several causes of disease above stated, the same person is, at different times, liable to be affected with different local maladies, attended with excessive determination of blood. Thus cold shall at one time produce undue determination to the eyes, and at another time to the throat.

(CLVII.)

But, in the same person, we more generally see a tendency to the same local disease. Thus one man shall be subject to coryza, another to quinzy, and a third to pleurisy; all from the same exciting cause: and although the place of the disease is often determined by the part to which the cause is applied, this is not always the case; cold applied to the feet often producing catarrh, and to the face, gout in the feet.

(CLVIII.)

It may indeed happen, that in these cases, conformably to the principles already laid down, cold, by diminishing the afflux of blood to one part, may increase it to another; but, that fact being admitted, the question still remains, what it is that determines it to that other part in preference to the rest? For it must be acknowledged, that this kind of predilection is what we see actually happen under various circumstances of increased momentum; so that, whatever cause be applied, whether mental agitation; full diet; wine; cold; violent exercise; excessive heat, &c.; certain persons, if morbidly affected at all, will uniformly have gout, other persons affections of the liver, others head-ache, others scrofula, &c. &c.

(CLIX.)

Here, then, we are again induced to have recourse to the supposition of a predisposition, or previous tendency to that particular disease, in the person liable to be thus affected.

(CLX.)

In this manner we are able also to explain, why, when from a local cause a general increase of momentum is produced, the local malady, to which the constitution is prone, often supersedes the accidental one. Thus catarrh is often suspended by gout; and this gives rise to the absurd notion of a gouty catarrh.

(CLXI.)

In this way may be understood many of those changes of determination, which have been called Conversions of disease, and of which every experienced practitioner must have noted numerous examples. Of these we shall hereafter have occasion more fully to speak.

(CLXII.)

In reality, there seems to be a general, though not universal, law of the human constitution, that excessive morbid determination to two different parts shall not exist in the same person at the same time. This rule holds good not only with regard to gout, but a great number of other maladies, which succeed or alternate in the same patient.

(CLXIII.)

Neither is this succession, or alternation, confined to one particular texture, any more than to one particular part; for he who has a catarrh to-day, may have a fit of the gout to-morrow; then a discharge of blood from the hæmorrhoidal veins; and, shortly afterwards, a rupture of the medullary substance of the brain, from sanguineous effusion.

(CLXIV.)

It is, indeed, probable, that, although these various diseases arise in parts differently organized, and therefore, in the language of BICHAT, of different textures; yet there is in them this common circumstance, that they are all affections of the same constituent parts, namely, the sanguiferous system, and its dependencies; an important point, affording, on various occasions, just grounds of analogical conclusion.

(CLXV.)

This change of determination is a most interesting subject of animal pathology, of which physicians have much attempted to avail themselves in the treatment of diseases.

(CLXVI.)

It cannot be doubted, that measures pursued with this view, or, according to common language, that of setting up new actions in the constitution, have sometimes succeeded. In this respect, the result has been conformable to that of violent accidents, which have

occasionally suspended, or even wholly removed, pre-existing maladies.

(CLXVII.)

Experience, however, unfortunately shews, that these means are less powerful than physicians have been induced from theory to expect. Accordingly, it is usually in vain that we attempt to solicit to the extremities that mode of excessive determination of blood, which is called the gout; though we attempt it by topical heat, friction, blistering, or any other measure of the class of derivatives.

(CLXVIII.)

In fact, although such a suspension or cure of a disease may perhaps be occasionally produced by certain violent causes, (as I have known spasmodic asthma suspended by a stunning blow on the head,) yet, in the common order of conversions, the new affection, or determination, is, in point of time, either coexistent with the disappearance of the old one, or more usually subsequent to it; so that, in reality, we cannot cure a malady by bringing on the gout, but must first cure the malady, and then, in a predisposed constitution, there is a fair chance that the gout will supervene. That this is the real order of facts, abundant experience has demonstrated to me; and we shall find, in the sequel, that the same principle is applicable to a great number of other occasions of the highest practical importance.

(CLXIX.)

Whether local morbid determination occurs from causes acting primarily on the part, or secondarily through the medium of excessive general impetus, it is equally difficult to explain the process by which it is effected.

(CLXX.)

Bichât speaks of the extraordinary afflux of blood to particular parts, as being the result of an increase of the powers of life. To these words I am utterly unable to attach any definite ideas.

(CLXXI.)

All which, in such cases, the evidence of our senses teaches us, is more or less of the states described in (LXVI. et seq.); and this state of the vessels is equally true, whether it arise from the preponderance of the elastic over the tonic power, from a vital elongation of the circumference of the vessels, like what occurs in the radiated fibres of the iris, or from any other cause.

(CLXXII.)

Neither is it of any essential consequence, except to those who found their therapeutics on false modes of reasoning, whether this state of vessels be owing to weakness or strength, to diminished or increased

action. These also are mere words, of obscure application to the facts, and unimportant with regard to the cure; which should be founded, not on assumed principles of reasoning, but on a direct observation of the quality and succession of phænomena.

INFLAMMATION,

AND ITS CONSEQUENCES.

(CLXXIII.)

AMONG the different modes of increased determination of blood, one of the most conspicuous is that which is called Inflammation.

(CLXXIV.)

Of this mode it is not easy to assign the precise characteristic marks, because, as BICHÂT very justly observes, each texture, under that affection, has its own particular appearances. Those, however, which are common to most, are, durable preternatural fulness and consequent distention of vessels, together with increased redness, of more or less of a florid hue. At the same time, when the diseased part is near the surface of the body, its sensible heat is augmented beyond the degree usual to that part. A considerable change also occurs with regard to the feelings of the part; which is not only, in general, more or less painful, but becomes unusually tender or susceptible of pain from any impulse against it. Such is the state of parts naturally sensible; and it is said that many

parts naturally insensible, as tendons, peritonæum, &c. acquire sensibility from inflammation.*

(CLXXV.)

It must be acknowledged, that this is rather a description than a definition of inflammation; but on this, and on various other occasions in the science of nature, the gradations from one object or one condition to another are often so minute, that although in the extreme cases the differences can easily enough be perceived and described, certain intermediate states can scarcely be distinguished, and much less be accurately defined. Thus, in the present instance, it may be doubted whether this whole description do not include many examples of increased momentum of blood, which could not be arranged under the term Inflammation.

(CLXXVI.)

Something more, then, being necessary in order to ascertain the distinction, let us inquire into the farther phænomena, as they concern the part affected, or the constitution.

(CLXXVII.)

When the phænomena are merely local, they usually

* Bichât supposes that an increase not only of organic sensibility, but of animal sensibility, which latter is that to which we usually give the name of sensibility, is prior to the afflux of blood to the part. Unfortunately, however, the proofs, which he adduces, are only those of excited sensation; and not of an increased *power* of sensation, which is the point in question.

recede in one or other of the following manners, according to the degree of the disease, the nature of the texture, or the previous condition as to health of the part affected.

First, in very slight or unextensive cases, the symptoms gradually disappear, the colour of the part becoming less florid, and the superabundant blood leaving the vessels, which apparently contract, and return to precisely their former state. This process of recovery is what is strictly called Resolution. It is, I believe, extremely rare; for I cannot recollect a single instance of inflammation, however slight, which did not, in some degree, come under one or other of the following heads.

Secondly, In other instances, there is some exhalation from the over distended vessels, either chiefly into the cellular substance of the part, or neighbourhood; producing swellings, which are more or less lasting, apparently according to the nature of the texture, or of the fluid effused; or else, on other occasions, into what are improperly called natural cavities, as between the duplicatures of the pleura, peritonæum, tunica vaginalis testis, &c. &c.

In both these cases, of which many examples will be hereafter given, no loss of substance takes place in the part or its neighbourhood; although the structure or functions of both may, from that effusion, be either temporarily or permanently impaired.

Thirdly, In other instances, that species of fluid called Pus is formed; the part being generally more or less injured by abscess or ulceration; though a similar

fluid seems to be occasionally secreted from entire surfaces.

Lastly, The vital power of the part being destroyed, its red colour, warmth, and sensibility are lost, circulation ceases in more or fewer of the vessels, and that state occurs, which is called Sloughing or Mortification.

This state is often preceded or accompanied by effusion of blood into part of the texture intermediate between, or exterior to, the vessels.

It appears, therefore, that in all these examples, except the first, there is a natural tendency to evacuation of fluid from the diseased parts.

(CLXXVIII.)

When local inflammation is extensive or violent, it is usually accompanied with increased action of the heart, and consequent excessive momentum of the blood in general.

(CLXXIX.)

This increased action of the heart often shews itself by more or less of the following phænomena in the radial arteries. The pulse seems as if it was produced by a number of detached solid globes passing in succession through the artery; an effect probably owing to a very strong and rapidly accomplished contraction of the left ventricle, followed by a complete and comparatively long quiescence.

(CLXXX.)

When such an excessive momentum occurs, the

parts affected undergo changes similar to those above described, with gradations proportioned to the state of the several parts, and of the violence and duration of the increased impetus.

(CLXXXI.)

In these cases of concomitant constitutional affection, and occasionally, though less frequently, in cases simply local, blood drawn from either of the veins of the arm, in a projecting stream, received into small vessels with polished internal surfaces, and cooled in a moderate temperature of the air, exhibits on its surface more or less of what is called a buffy coat; that is, a layer, of greater or less thickness, of Fibrine firmly concreted, and covering a coagulated mass containing the red globules; both surrounded with the serum, which has often a bright yellow tinge. In this case the whole mass is firmer than is natural, and the surface of the concreted fibrine is often concave, with fimbriated or puckered edges. From the coincidence of these appearances with the symptoms of local inflammation, blood so circumstanced is called inflammatory; and fevers, in which it exists, are often named Inflammatory Fevers.

(CLXXXII.)

I do not recollect to have seen more than one or two cases of local inflammation accompanied with general increased impetus of blood, or what is called fever, in which some part of the blood, drawn with the precautions above mentioned, did not exhibit this

appearance ; when other portions of blood taken from the same patient at the same bloodletting into a larger vessel, or one with a rough inside, such as Queen's ware, though first drawn, and having the freest flow, has had no such crust.

(CLXXXIII.)

Such an appearance, therefore, affords a presumption of some local inflammation. It is not, however, absolutely decisive ; because it not only usually attends the state of pregnancy, but is a frequent concomitant of excessive momentum of blood accompanying other morbid determinations, as Hæmorrhage, &c. and sometimes occurs in the commencement of Synocha, before any symptoms of local inflammation have shewn themselves. Other instances of a similar kind might be adduced. I have also, though rarely, seen a similar state of blood in very old persons, in whom, with no marks of local inflammation, the pulse has not exceeded the frequency natural to those patients, of 60 or 70 beats in a minute ; and also in certain instances of the state which is called Nervous, totally exempt from topical inflammation, with a soft, and even weak, pulse, of 72 beats in a minute.

(CLXXXIV.)

This condition of the blood would characterize the higher degrees of that state, which was formerly called the Phlogistic Diathesis.

(CLXXXV.)

The process above-mentioned, of evacuation from vessels, containing blood under a certain state of increased impetus, is strongly illustrated by the common case of sweating from exercise or violent heat. The order of Phænomena in this instance is too obvious to be mistaken, and affords legitimate grounds for analogical deduction. Various other examples of a similar order of phænomena will be adduced as we proceed.

(CLXXXVI.)

It is worthy of remark, that as permanent increased dilatation of vessels, following excessive momentum of blood, does not usually occur till some time after that momentum has commenced; so sweating after exercise, exposure to heat, or the hot fit of a fever, does not take place till after a somewhat long duration of the excessive impetus arising from, or accompanying, those causes.

(CLXXXVII.)

In the description which has been given of the general circumstances of inflammation, enough, in the opinion of some persons, may have been already said in explanation of its distinguishing marks. Since, however, on subjects which so nearly concern the welfare of mankind, we cannot be too cautious in our decisions respecting the nature and order of phænomena, it may be right in this place to investigate, at somewhat greater length, the proofs of the existence

of increased momentum of blood in local inflammation, and the relation which this momentum bears to the state of inflammation, whether as a cause, a collateral circumstance, or an effect.

(CLXXXVIII.)

Here, then, it may be observed,

First, That the persons who are most prone to inflammation, are those, whose circulation is most apt to be excited to increased momentum. Such are persons from early youth to some time after the establishment of adult age; those who are in the decline of life; and those individuals, of whatever age, who have the marks of a plethoric state.

Secondly, Inflammations occur from the causes which either immediately or secondarily produce increased impetus. Of the immediate causes are those specified above; as, violent exercise, mental agitation, full meals, strong drink, hot climates. Of the secondary ones are cold, and other impressions producing what is called reaction, as before explained. On this latter account such diseases are most prevalent at those seasons, when persons are most exposed to the vicissitudes of natural heat and cold, as in the autumn and spring, or in the winter, when, after being much and long cooled, they voluntarily heat themselves by fires.

Thirdly, Local inflammations actually often occur from these remote causes, when they are found to have produced a quicker and stronger action of the

heart, unaccompanied with any other perceptible morbid state.

(CLXXXIX.)

With regard to the farther proofs of the existence of excessive momentum in inflammation, we must recur to that general principle of motion, that the momentum of any moving body is as its quantity or weight, multiplied into its velocity.

(CXC.)

If, then, it can be proved, that the Quantity of blood moving through an inflamed part in a given time is greater than through the same part in a sound state, the conclusion as to momentum will follow, though the velocity should not be increased.

(CXCI.)

In order to make the examination in a proper manner, we must take, in an acute and therefore decided stage of the disease, an inflamed part of sufficient dimensions, and so situated, that all the circumstances respecting it shall be as much as possible cognizable by our senses.

(CXCII.)

In such an inflamed part,

First, we perceive, by the colour, swelling, and heat, that its vessels, in the aggregate, are preternaturally distended with blood.

Secondly, we perceive by the touch, that the arteries leading to the part are preternaturally distended with blood.

Thirdly, we both see and feel, that the veins leading from the part are preternaturally distended with blood.

(CXCIII.)

Hence it appears, that the quantity of blood in such a part at any given time is greater than natural.

(CXCIV.)

Next, with regard to the Velocity, we find that the impulse of the systole of the heart is communicated to the column of blood circulating in the arteries leading to the inflamed part, just as often, and with at least as much strength, as to that in the same arteries, supplying corresponding healthy parts.

(CXCV.)

Of the velocity of circulation of the blood in the returning veins, any person may judge from the preternaturally prominent veins on the back of the hand and arm of a person affected with violent gout in the wrist. If, in this case, the arm be held horizontally, any one single trunk of a vein compressed, and the blood stroked out between the pressure and the heart, as soon as the pressure is removed, the blood will be seen to resume its course in the vein, with a rapidity fully equal to that in the same vein in the other arm, so placed, which is in a state of health.

(CXCVI.)

Since then, in this case, the quantity of blood existing in the inflamed part in a given time is greater than in the same part in a healthy state, and the velocity with which it passes through the part is as great, the conclusion as to increased momentum is fully established.

(CXCVII.)

The cases which have been stated are the most unfavourable to the conclusion adopted, because they suppose no increased quickness of contraction in the left ventricle of the heart. If, however, we assume a state of fever, or of increased velocity and force in the systoles of the heart, it is evident that the momentum of the blood in the inflamed part must be proportionably increased. Now almost all considerable inflammations are accompanied with fever; and therefore, in such cases, a proportionably greater degree of momentum than that which I have supposed, must be admitted.

(CXCVIII.)

If to these proofs it be necessary to make any addition, that which follows appears to me absolutely decisive.

It has been already observed, that, according to many physiologists, and very recently BICHÁT, the force of the heart is insufficient to carry on the entire course of the blood, but that it is lost when the blood reaches the capillaries, and, *à fortiori*, before it

reaches the veins. Of this opinion, which I conceive to be erroneous, I here avail myself, merely to suggest, how difficult it is to shew the influence of the systole of the left ventricle on the returning venous blood during health.

(CXCIX.)

Since, however, it frequently happens that in gouty inflammation of the wrist, blood taken from the cephalic vein is propelled in jets, as strong as those from the temporal artery, and precisely synchronous with the pulse in the radial artery in the other arm, and therefore with the systoles of the left ventricle of the heart, there can be no doubt that these jets are produced by those systoles; extending their projectile force through the capillaries, and nearly back through the entire course of circulation to the right auricle.

(CC.)

If it be contended, that in these cases the jets are produced by the simple diastole or dilatation of the neighbouring brachial artery; it will be incumbent on those who use this argument to shew, first, that such a dilatation actually takes place; and secondly, in what mode it can produce the effect attributed to it.

(CCI.)

Neither can these jets have a direct relation to the common contraction of the vena cava inferior; for if ever any considerable regurgitation from that cause takes place even in the vena cava itself, it can occur

only when the passage of the blood from the right auricle is obstructed by some violent impediment, either in the right annulus venosus, in the semilunar valves of the pulmonary artery, or in the lungs; of neither of which is there, in many of these cases, the smallest ground of suspicion.

(CCII.)

To these *a priori* arguments may be added the conclusive one, that the regurgitation of the blood from the systole of the vena cava inferior, on which the whole objection depends, cannot possibly, in these instances, have extended to the superficial brachial veins, not only on account of the natural valves, but from the total interruption of the stream of blood, by means of the ligature interposed between the orifice in the cephalic vein, and the vena cava.*

* If, in this case, the different operations of the systole and diastole of the heart on the blood are distinctly perceivable in that of a vein so remote, in the course of circulation, from the heart; who can reasonably doubt, that the power of that organ is always adequate to the gentle flow of venous blood, which takes place in the common states of health and rest?

Were there a propulsory action of the capillaries and veins, essential to the process of healthy sanguineous circulation, we might reasonably conclude that such action would be, if not greatest, at least not wanting, when that of the heart was defective. Yet, on the contrary, in those diseases of the heart in which its valves are indurated, and its muscular substance is in an extraordinary degree lax and extenuated, so that the patient dies of syncope, we often find the heart completely empty of blood; whereas on the supposition of an independent propulsory power in the capillaries and veins, blood ought to abound in the right auricle.

(CCIII.)

These facts prove, beyond all reasonable doubt, that, in certain stages of inflammation, an excessive momentum of blood exists in the vessels of the inflamed part.

(CCIV.)

How far this excessive momentum may be considered as a cause, it still remains for me to inquire.

(CCV.)

And here,

First, the pain of inflammation is often of a throbbing kind, evidently aggravated by each systole of the heart, with which each throb is synchronous.

Secondly, the fulness of vessels, swelling, redness, heat, and pain, that is, the chief circumstances constituting inflammation, are increased by the local and general causes, which invite or propel more blood to the part. Thus the symptoms of gout, when superficial, or of erysipelas, are increased by the local application of heat, whether from clothing, fire, hot water, or the rays of the sun, and by the depending posture. These and other inflammatory affections are also aggravated, and, after having been relieved, are sometimes renewed, by whatever increases the action of the heart, and therefore the momentum of the blood; as mental emotions; muscular exertions; heat of fires, baths, warm clothing, and crowded rooms; food; spirituous liquors; hot drinks; late hours, &c.: also by compressing any collateral branch of an artery; in consequence of which more blood is determined to

those branches which supply the inflamed part. On all these occasions, when the pain is of the throbbing kind above mentioned, the throbbing is evidently augmented by the cause of aggravation, whatever it may have been; which, therefore, must act by increasing the impulse of blood from the heart.

Thirdly, *è converso*, the pain and other circumstances of inflammation are abated by the local and general causes which diminish the momentum of blood in the inflamed part.

Thus, they are relieved or cured by the topical abstraction of heat or of blood. The same effect also arises from mechanical compression, the power of which, accident has occasionally shewn, and contracted views have directed only to certain conditions of the inflammatory state. They are also mitigated or cured by whatever diminishes the action of the heart; as rest, especially in the horizontal posture; mental calmness; early hours; the abstraction of heat by the external application of cold air, cold water, ice, &c. or in form of drink; by certain medicines called Sedative; by spontaneous or artificial evacuations, as of fæces, and more especially of blood; and by every thing which produces a tendency to syncope. Lastly, they may be mitigated or cured by whatever intercepts or diminishes the flow of blood in the particular arteries leading to the affected part. This may be effected by various spontaneous changes of determination, constituting the conversions before stated. They may also be relieved by temporary mechanical compression of the arteries supplying the

part, as I have long ago stated in whitloe, gout,* &c. and, according to Mr. KELLIE, may be cured by that process continued for a sufficient length of time by the tourniquet.

(CCVI.)

If, then, in every palpable case of inflammation there is excessive momentum of blood; if we increase the inflammation precisely in proportion as we increase the momentum, and diminish the inflammation precisely as we diminish the momentum; we have, I think, just right to consider the excessive momentum as an indispensable cause of what we see of inflammation, whatever may have been the more remote causes, or whatever other invisible intermediate circumstances in the constitution or the part there may be, antecedent to the excessive momentum which we perceive.

(CCVII.)

Neither will this conclusion be invalidated, were it even proved, according to the opinion of DR. WILSON, that the velocity of the blood in the vessels of an inflamed part is diminished; unless it be also proved, that the velocity is diminished in a greater proportion than the quantity is increased.

(CCVIII.)

I have been the more minute in my attempts to establish the quality and order of phænomena on this

* Memoirs of the Medical Society of London, vol. iii. p. 77.

important subject, because the principle will serve to illustrate various other diseases, which have hitherto been considered as very different in their natures, and therefore as leading to very different practices.

(CCIX.)

It having been thus proved, I think satisfactorily, that excessive momentum of blood exists, and is an invariable cause in certain distinct cases of that series of phænomena, to which we give the abstract name Inflammation; we have a right, conformably to the laws of sound philosophy, to conclude that it exists, and is a cause in all.

(CCX.)

From the above circumstances it seems also probable, that the immediate cause of local predisposition is a proneness to dilatation in the vessels of the part liable to such maladies, by whatever process that dilatation may be effected.

(CCXI.)

Although this proneness to dilatation may be a part of the condition which disposes to inflammation, it is not peculiar to it; but will, I think, be found to bear the same relation to various other maladies.

(CCXII.)

That the morbid dilatation of vessels is the mere mechanical effect of general increased impetus, I am by no means disposed to assert. On the contrary, I

have endeavoured to shew above, that the fulness constituting part of the local momentum often accompanies a dilatation of vessels arising from causes apparently acting merely on their own tonicity, without any increase of the *vis a tergo* from the heart; and even that the increased action of the heart often follows, instead of preceding, the excessive local dilatation. All, however, which, on this occasion, I am concerned to shew is, that increased momentum of blood in a part is essential to local inflammation; and that inflammation may arise from general increased impetus, although it sometimes occurs without it.

(CCXIII.)

There seems, indeed, to be no reason why certain modifications of impulse of the blood may not, even mechanically, excite in the capillaries those vital affections, which constitute health or disease; just as different degrees of exercise, producing different degrees of impulse on the heart, and consequently different degrees of action, improve or impair the functions of that organ.

(CCXIV.)

The influence of increased or diminished dilatation from excessive or lessened impetus being however established as a fact, many important practical consequences follow.

(CCXV.)

It must here be observed, that the maladies which

we arrange under certain abstract terms, are far from exhibiting the same phænomena throughout their whole course. Thus in what are called inflammatory diseases, as gout, phlegmon, &c. changes take place in all constitutions at particular periods of the disease; so that although the same appellation may be continued, the actual phænomena of the parts may be essentially different from those previously existing. Thus, just as the heart loses its power of acting after undue stimulation, so in a phlegmon the tonicity of the capillary arteries may be lost after undue dilatation, and may concur with such other changes in the part, as may constitute its death or mortification. So also after gouty inflammation in the vicinity of a joint, the actual state of inflammation shall be completely gone, while nothing shall remain but lividness of the part, and swelling from extravasation, together with some difficulty of motion, the effect of that extravasation; and yet the malady is still called gout.

(CCXVI.)

During the process also of recovery there probably always are certain periods, in which, in consequence of undue distention by fulness, extraordinary redness, and swelling, together with pain, may continue, and yet the velocity of the blood in the part may be reduced below its natural standard. This condition, which would probably take place for some time after the arteries leading to an inflamed part were tied, would still be called by the gross name inflammation.

(CCXVII.)

When therefore I speak of excessive momentum in inflammation, I refer to what may be properly called the acute stage of the malady, and which is essential to the production of all the subsequent phænomena.

(CCXVIII.)

The existence of the acute stage is not to be determined from the mere circumstance of duration; which will vary in conformity to the state of the constitution and part, and the coexistence and force of the causes of production, aggravation, or diminution, already specified.

(CCXIX.)

The same circumstances will doubtless modify the changes which take place in the part or its neighbourhood, or in the whole constitution, during the progress of disease towards cure, or death.

(CCXX.)

To the conclusion thus formed respecting the cause of inflammation, it may be objected, that this cause certainly cannot be the proximate, since it has been admitted that excessive momentum is not always or immediately followed by inflammation; whereas, according to the usual definition of Proximate Cause, it is that, without which the disease cannot exist, and, which existing, the disease must exist also. To this I answer,

First, that, according to this definition, the proximate cause is, strictly speaking, a part of the disease;

which implies the absurdity, that a thing is the cause of itself.

Secondly, the very name *causa proxima*, or, that which is nearest to any thing, shews that it cannot form a part of that thing; unless we admit that a thing can be at the same time a part of another, and not a part of it.

Thirdly, Causation, according to all our conceptions respecting it, implies not only difference and separation, but also priority. This definition of proximate cause, therefore, involves the farther absurdity of being at once prior to an effect, and coexistent with it.

(CCXXI.)

In reality, on various other occasions, we consider as the proximate cause of a disease that phænomenon or process, which, according to our perception or conclusion, is next before those, which appear to us to constitute the disease; whether the disease invariably follow that phænomenon or process, or not. Thus the absorption of bile is said to be the proximate cause of Jaundice, because without it there could be no jaundice; although we know that bile is every day absorbed into the circulation, without producing that disease. In all cases effects must depend on the degree or force of the cause.

(CCXXII.)

In defining the terms, I should therefore be disposed to say, that a Proximate Cause is that phæno-

menon in the body or part most immediately preceding the state which we call disease, without which previous phænomenon the disease is not known to exist.*

(CCXXIII.)

Neither is it essential that the phænomenon or cause should be peculiar to this particular series or disease. The effect must bear a relation to the object which is to be acted on. In order to counterpoise a guinea, it is necessary, not only that there should be a weight in the opposite scale, but that the weight of the guinea itself should be accurately ascertained.

(CCXXIV.)

Whatever name, therefore, we affix to phænomena so arranged, and whether they immediately precede the symptoms constituting the disease, or are far before them in the series, so that the real proximate cause shall have been discovered to be increased action of vessels, increased vitality, &c. or shall be eternally hidden from our view; yet, if these phænomena are causes essential to the disease, without which it cannot exist, the knowledge of them is that which is chiefly important in the pathology, because it is that alone, which can direct and methodize the application of the means of cure.

* Dr. CULLEN is much less precise in his use of this term, when he seems to admit of two different proximate causes of Dyspepsia. First Lines of the Practice of Physic, edit. 4, vol. iii. p. 220, 222.

(CCXXV.)

To this rule of philosophizing I would wish to call the attention of the reader, not only with regard to the characteristics of the morbid state immediately before us, but in the investigation of all those which will occur in the course of this work.*

(CCXXVI.)

I have already remarked, that, under the increased dilatation of vessels which occurs in local inflammation, without constitutional affection, the vessels have an inherent power of resuming their natural state of contraction. It may be added, also, that those vessels, which, while in health, did not admit red globules, but which during inflammation were more or less distended by them, on recovery again no longer admit them.

(CCXXVII.)

This power of contraction in certain vessels, so as to expel misplaced or superfluous blood, is by some writers adduced as a proof of the share which such vessels have in carrying on the ordinary circulation of the blood. If, however, any person shall candidly compare the velocity of the usual circulation with that of

* Those who would wish to see how far the order of phænomena, which I have detailed, accords with that of BICHÂT, in which, with strong marks of acute observation of detached facts, there appear to me much gratuitous assumption and erroneous reasoning, may consult his Anatomie Generale, vol. ii. page 469 and following, Systemes Capillaires; and especially pages 496, 497, &c. on subject of Inflammation.

the blood in the minutest arteries when separated from the heart, in the microscopical experiments of HALLER, or with the time which elapses before the vessels of an inflamed part return, by resolution, to their healthy diameter, he will justly conclude this expulsory power to be nugatory for the great purpose of general circulation.

(CCXXVIII.)

A similar power of contraction exists, also, when there is a concomitant increased impetus of blood from the heart. It is however certain, that, in the latter case,, the topical symptoms seldom subside till after the general ones, unless some other topical determination takes place.*

(CCXXIX.)

In reality, after most cases of increased action, the heart falls into a state of unusual quiescence, so that its systoles become not only less frequent, but less strong, than is usual in health ; while at the same time, by the circumstances arising from, or accompanying, this increased action, the general mass of blood is more or less diminished.

(CCXXX.)

It is difficult to say whether an exhaustion of the heart, in consequence of over exertion, or the abstraction of a quantity of that blood, which is so great

* This fact affords evidence, in addition to that before adduced, of the dependence of local dilatation on general increased impetus.

a stimulus to its action, be in this case the chief cause of its quiescence. Both probably concur. Collateral circumstances, which will hereafter be more particularly brought into view, seem to shew that the latter cause is of considerable power. But be the cause what it may, it is easy to see how the quiescence, when it has occurred, must, by diminishing the morbid momentum, contribute to the recovery of the natural contraction of the over dilated vessels.

(CCXXXI.)

On the other hand, if, in consequence of a too sudden restoration of the plethoric state, or any undue stimulation, the heart is again excited to excessive action, the local disease is readily reproduced; or, in its stead, some new disorder occurs, having certain essential qualities in common with the former.

(CCXXXII.)

This reproduction of the same, or the occurrence of a virtually similar, disease, often attended with the most painful or dangerous consequences, we continually see after various febrile and other extenuating maladies; when, under the delusive notion of strengthening the patient, he is pampered with full diet, and stimulated with every description of drams, whether solid or fluid, which the elaboratory of the cook, the vintner, or the apothecary, can supply.

(CCXXXIII.)

And here we may recur to the principle already

suggested, that the quantity of blood suited to the salutary performance of the circulation, through its various functions, is by no means always the same in the same person, but adapted to the existing circumstances of the constitution. Thus a man in the midst of health and youth, and of due uniform muscular exertions, shall habitually have a considerable degree of fulness of the sanguiferous system, and yet shall long continue to enjoy an exemption from disease. But should the same man, after having been emaciated, suddenly grow full of blood, some violent disease, or succession of diseases, will usually again occur, and reduce the habit to its former state of emaciation.

(CCXXXIV.)

A multifarious series of this kind will sometimes occur during what is called Convalescence from a long or violent disease: and, in other cases, where health and strength have succeeded to great extenuation, and have continued for months and even years, no sooner has the habit, by degrees, recovered its prior fulness, than the same, or a similarly acting, disease shall return, and reduce the patient to such a state as that which followed its former plethora.

(CCXXXV.)

This course we see continually exemplified in gout, erysipelas, and various other diseases, which are called constitutional; and indeed they are so frequent, that one cannot help considering the increased action of

the heart, and the general circumstances of disease connected with it, as natural efforts to remove a degree of fulness, incompatible with the due performance of the healthy functions of that individual constitution.

(CCXXXVI.)

Under circumstances of previous reduction of the habit, from whatever cause, a series of morbid effects, greatly exceeding those which happen to persons in robust health, occurs so quickly, not only after a full or otherwise improper meal, but also from mental emotions, watching, wine, &c. as to afford rational ground for the conclusion, that, in such cases, the heart is disposed to be affected in a morbid degree, by these causes acting simply as immediate stimuli.

(CCXXXVII.)

This subject, important in all its relations, will again demand our consideration in a subsequent part of this work.

(CCXXXVIII.)

In the examination of the structure of the animal frame, Bichât has divided the whole into several systems, according to their different textures or functions. These are

The Cellular;

Nervous;

Vascular, of red and black blood;

The Capillary;
- Exhalant;
- Absorbent;
- Mucous; lining the mouth, stomach, intestines, &c.
- Serous; forming the pleura, peritonæum, arachnoid, &c.
- Synovial; lining the cavities of joints, and forming certain sheaths of tendons;
- Glandular;
- Dermoid;
- Epidermoid;
- Pilous;
- Osseous;
- Medullary; forming the marrow;
- Cartilaginous;
- Fibrous; as the periosteum, dura mater, aponeuroses, tendons, ligaments, &c.
- Fibro-cartilaginous; the ears, alæ nasi, trachea, &c.
- Muscular.

(CCXXXIX.)

These several parts vary in their functions, and in the quality and order of the phænomena which constitute their diseases, which sometimes affect one texture, while another, in union with it, remains in perfect health. Thus there shall be inflammation of the peritonæal coat of the intestines, while the internal or mucous membrane, and the fibrous or muscular coat, shall suffer no change. So, also, in the inflam-

mation of the pleura pulmonalis, the substance of the lungs is frequently undisordered.

(CCXL.)

Though, however, this is often true, it is not always so; and the question remains, whether, in all the different textures, there is not one component or constituent part, which is primarily affected in that morbid change called inflammation.

(CCXLI.)

There can be no doubt that such a part exists, and that this is the Capillary System; a system, which, as I have before observed, is continued on from the arteries, and ends partly in veins, and partly perhaps in exhalants, and secretory organs, in whatever texture they exist, whether the brain, lungs, intestines, or any other part of the animal frame.

(CCXLII.)

It has been before stated, that all the terminations of inflammation, except possibly that of resolution, are attended with extravasation. The same process occurs in cases of general increased impetus, as in sweating after strong exercise, exposure to heat, palpitation of the heart, fever, &c.; in all of which a reduction of the increased impetus follows the effusion.

(CCXLIII.)

Great numbers of examples to the same effect will hereafter be adduced; and, in all, the connection is

so evident, and the relief so apparent, that we cannot help conceiving the evacuation to be a process expressly designed for the purpose of mitigating or curing the disease.

(CCXLIV.)

A remarkable provision is, indeed, made for this benevolent purpose by the Great Author of Nature.

(CCXLV.)

Wherever important functions are to be performed, there we find a large supply of blood by means of arteries, either capacious or convoluted, proceeding into minute subdivisions, terminating in an infinite number of capillaries, variously arranged, and carrying either blood or colourless fluids.

(CCXLVI.)

Now as this very state would be apt to dispose such parts to congestions of blood, and all other circumstances which constitute inflammation, and various other maladies, a farther provision is made, of a structure which tends to obviate these inconveniences.

(CCXLVII.)

In this structure the leading circumstance is the contiguity, to the various organs, or the existence in them, of an apparatus, abundantly furnished with exhalants or secretory vessels from the arterial or capillary system of the respective parts.

(CCXLVIII.)

This apparatus consists either,

First, of some simple surface, as the skin and various parts of the mucous membrane.

Secondly, of some natural cavity, the internal surface of which is lined with similar membrane, as the stomach, bowels, bladder, &c.

Thirdly, of some discontinuity of substance, forming a virtual, though often not a real, cavity; into which either exhalants open immediately, as in the cellular system; or which is lined with membrane, capable, by means of similar exhalants, of furnishing its appropriate fluid, as the ventricles of the brain, medulla oblongata, and nerves; the intervals between the coverings or sheaths of the same parts, the duplicatures of the pleura and peritonæum, the pericardium, the synovial receptacles, &c.

Fourthly, of some excretory duct or ducts communicating with the part, if glandular, as in the mammæ, liver, kidnies, salivary glands, &c.; in which cases the duct answers the double purpose of providing during health a salutary fluid, and of evacuating the part, when affected with excessive momentum of blood.

(CCXLIX.)

It is observable, also, that the several organs so supplied have, usually, the combination of two of these circumstances of structure, so as to acquire a double power of evacuation, either immediately from themselves, or from neighbouring portions of the

same arterial branches. Thus the lungs have pleura without, and mucous membrane within; the liver, peritonæum without, and pori biliarii from within, &c. To these may be added the cellular, parenchymatous, and other substances, forming a proportion of the mass of various parts, and affording a third emunctory for the superfluous contents of blood-vessels, by means of exhalants and secretory capillaries, every where opening into them, as through the membranes before described. This is the case in the medulla of the brain, and in various other organs; in which we often find exhaled fluids, as well as between the membranes and in the ventricles of the former, and on the several surfaces of the latter.

(CCL.)

Such contrivances as these are so general, that I recollect only two instances in the adult, which can be considered as exceptions. Of these, the first is the Thyroïd gland, which has no known excretory duct, and the uses of which are hitherto undiscovered. Another example of the same kind may possibly be suggested in the Spleen; an extraordinary viscus, abounding with black blood, and which, though void of any internal cavity, or excretory duct, and having no adequate means of evacuating itself by secretion or exhalation, is not very liable to inflammation, or other known diseases. Perhaps, however, this indisposition to disease may arise from the peculiarity of its structure, and the nature of its blood; the occasional redundances of which may be from time to time

removed without previous injury to the organ itself, just as happens with regard to the blood accumulated, on particular occasions, in the cavernous and spongy bodies of the penis.

(CCLI.)

By these different circumstances of structure, parts are supplied with the means of extravasation, under those circumstances of excessive momentum, which constitute inflammation.

(CCLII.)

The nature of the fluids effused in inflammation, and their effects on the several parts, vary considerably, according to the nature of the texture from which they originate, and to the degree of the malady which gives them birth.

(CCLIII.)

Of extravasation following inflammation, the simplest form is that of Serum, effused into the cellular substance, which, in the beginning, is, probably, wholly or chiefly that of the part. As in this system the cells have, in general, free communications with each other, the fluid easily diffuses itself to a greater or less distance in the immediate vicinity; but always, where the structure will permit, follows the law of gravitation relatively to the part primarily affected. Hence in a superficial gouty inflammation on the patella, the swelling, during the erect posture, shews itself chiefly, if not wholly, about the ankles and instep.

(CCLIV.)

Of this sort of tumour, when simple and uncombined, the chief characters are, that it is free from pain when touched, nearly colourless, and, when not in an excessive degree, leaving, for some time after pressure, a dent from the impressing substance, which only gradually disappears. It is a true Dropsy, and is entitled Anasarca or Œdema.

(CCLV.)

Such an exhalation of serum into the cellular texture of the part or neighbourhood follows many inflammatory diseases. Thus, it often terminates the inflammation arising in the gums from caries and other causes acting on the teeth; occurs in the leg in sciatica, and in the neighbourhood of joints suffering under rheumatism; takes place in the substance of the lungs from peripneumony; is a frequent consequence of erysipelas in the forehead, temples, eyelids, and cheeks, arising either spontaneously, or from external injuries, as blisters, leeches, &c.; occurs in the loose skin of the penis from paraphimosis, in various cases of sloughing; in the phlegmasia dolens of pregnant or parturient women; and doubtless in many other cases, which I have either not witnessed, or not noted. In all these instances, the fluid effused seems to be of the same kind, though liable to accidental mixtures; and is poured out by the exhalants which open into the cellular texture of the part, or immediate vicinity.

(CCLVI.)

A similar effusion often arises from inflammation of certain membranes, which, from their habit of being moistened with such a fluid during health, are denominated Serous. Such are the pleura, the external covering of the heart, and the internal of the pericardium; the tunica arachnoides of the brain; the peritonæum; the tunica vaginalis testis; the synovial membranes, and probably those lining the sheaths of tendons.

(CCLVII.)

It seems, however, as if serous effusion was not confined to what are called serous or cellular membranes; for in certain cases of pulmonary hectic an expectoration often occurs of a dense, hard, globular substance, partly transparent, and partly of a pearly whiteness, which immediately falls to the bottom of the water into which it is thrown, and has much the appearance of thickened albumen.

(CCLVIII.)

Serum also is effused immediately under the epidermis in various inflammations, as in the blisters arising from friction, pressure, and certain acrids, as heat, cantharides, &c.; and is probably the fluid which is included in the vesications of the shingles, pemphigus, and various other cutaneous maladies.

(CCLIX.)

The fluid which is called serum, and which appears

to be a constituent part of the blood, as it circulates in our vessels, is a substance composed of water, soda, albumen, and a very small proportion of fibrine. In consequence of the alkali which enters into its composition, it turns syrup of violets green. Albumen is well known to be the substance chiefly composing the white of an egg. It is soluble in cold water, is coagulable by heat and certain acids, contains a minute proportion of sulphur, and, according to Mr. BRANDE, is capable of being separated from the other constituents of serum by passing through that liquid the electric fluid by means of the voltaic pile. Fibrine is that substance, to which is owing the spontaneous coagulation of blood, when taken out of the vessels. It is that which shews itself on the surface of the blood drawn in inflammatory diseases, and which is called the buff coat; and it may be collected from all blood by continually stirring it till cold with a stick, around which it coagulates; after which process, what remains of the blood will no longer lose its fluidity by rest. Exclusively of this property of spontaneous coagulation, and of its insolubility in cold water, fibrine is said to differ very little, in its chemical qualities, from albumen.

(CCLX.)

Albumen is often seen floating in the serum, or attached to the cruor, or more especially to the fibrine forming the crust on blood, drawn in pleurisy and acute rheumatism. It probably constitutes the greater part of the gelatinous fluid, which is now and

then observable in the vesications produced by cantharides. In many cases of ascites after peritonæal inflammation, and of hydrothorax after pleurisy, in dropsies of the articular cavities following the gout and other inflammations of capsular ligaments, in that of the tunica vaginalis testis, and in some examples of effusions between the tunica arachnoides and the pia mater, I have seen the serum, exhaled from its proper membranes, interspersed with clots of albumen like jelly, chiefly in a considerable degree transparent, but even in some parts of the same clot more or less opake, and of a pearl colour.*

(CCLXI.)

From these particulars it appears that both albumen and fibrine are capable of being increased by those processes in the constitution which are called inflammatory; and as these substances are often found to occur together, it is, from this circumstance, as well as from their general chemical resemblance, highly probable, that they are the results of animal actions similar in certain stages, and differing either in the degree or number of the processes which they have undergone.

(CCLXII.)

As, in the healthy state of the body, serum is always more or less exhaled from its appropriate surfaces and textures, so all these parts are furnished with absor-

* In many of these cases the deposition of the albuminous clots does not take place during life, but is the result of the cooling of the serum.

bent vessels, which take it up when it is either in moderate excess, or no longer fit for the purposes for which it was originally intended.

(CCLXIII.)

Hence we should *à priori* conclude, that by a similar process it would be absorbed, when effused in that greater degree which constitutes the different forms of dropsy, usually denominated disease. This conclusion is conformable to the fact; the œdematous swellings, which follow gout and various other maladies, being often removed by absorption, so that the part, in an indefinite time, completely recovers all its former functions.

(CCLXIV.)

To what extent serum is in all cases capable of being absorbed, it is difficult to say. This capacity is particularly questionable in those cases, in which, after inflammation, there is an excess of albumen, or fibrine, or both, either dissolved in the serum, or floating in it in detached portions. I am not acquainted with any facts from which to decide absolutely on this point; though from the removal of certain hard and painless swellings about tendons, after gout and rheumatism, which we shall again have occasion to mention, one should be inclined to suspect that this might be the case.

(CCLXV.)

It is more usual that such an effusion terminates in the union of parts that are naturally disjoined, con-

stituting the materials of that process which is called Adhesive inflammation. We every day see this take place from the crusts of that substance, which has usually hitherto been denominated coagulated lymph, effused on the different serous surfaces already specified.

(CCLXVI.)

In this way we may explain, not only the more obvious examples of inflammatory adhesion in the thorax and abdomen, but probably, in some instances, the union of joints by anchylosis, and the permanent rigid swellings of ligamentous and tendinous parts after gouty and other inflammations.

(CCLXVII.)

To the same cause are probably owing the phænomena of permanent chordees, and the insuperable swelling and hardness, amounting almost to solidity, but unaccompanied with pain, of the lower extremities in some cases of long continued anasarca.

(CCLXVIII.)

Under the same head may analogically be arranged various like effects more or less resembling those of inflammation, produced by the same materials, extravasated from exhalants in other parts of the system, in which they every where abound. Of these are, the obliteration of arteries by cohesion, in cases in which the internal and fibrous coat are broken through, or at least inflamed, by ligature or by acci-

dent; and the production of what is real schirrus, in the opacity observable in the cornea, and capsule of the crystalline lens of the eye, and in various cellular or glandular parts, as the lips, the nose, the mammæ, the uterus, the testicles, the prostate, the liver, the spleen, the pancreas, the alimentary canal, and the lymphatic glands.

(CCLXIX.)

To the same head we may probably refer the preternatural hardness, amounting sometimes to schirrhosity, of parts, differing in extent, of the medullary substance of the brain, cerebellum, and medulla oblongata; of both the latter of which I have seen portions in a state nearly approaching to that of boiled gristle.

(CCLXX.)

So also the thickening, or pearly opacity, or both, which we often remark in the tunica, arachnoides of the brain; and also in the pleura and peritonæum in hydrothorax and ascites respectively, where previous inflammation has been often, though not always, ascertained. In the two latter cases, the serous membrane of the several parts is sometimes enormously thickened, and not unfrequently of a silvery whiteness, so as to resemble ligament or even cartilage, rather than semi-transparent membrane.

(CCLXXI.)

In one patient, the cartilaginous substance of the

epiglottis was from inflammation much thickened, and the whole part become completely immovable in any natural process.

(CCLXXII.)

To this head may probably be referred the permanent hard swellings of the periosteum, which often follow inflammation of that part, not only from siphylitic, but even rheumatic affections.

(CCLXXIII.)

Many other examples of similar changes might doubtless be added; but I omit them, as not having been observed, or at least noted, by myself. All seem to be consequences of albumen or fibrine, or both, either poured out, or stagnating in the course of vessels, or deposited in their interstices, so as to produce effects partially similar to those which occur in adhesive inflammation.

(CCLXXIV.)

The same substances seem to be the materials by which wounded parts unite, under the process called Union by the First Intention; so that, by whatever action albumen and fibrine are effused from vessels, they dispose the suffering parts, if sufficiently approximated, to grow together.

(CCLXXV.)

It is a curious physiological fact, that small parts of the body, if previously in a state of health, when

separated, and immediately applied either to the wound in the original body, or even a wound in another, will by the same process unite, and form a constituent part of the system to which they are so applied. The truth of this extraordinary fact, so ridiculed under the assertions of TALIACOTIUS, has been fully confirmed by JOHN HUNTER and other modern physiologists.

(CCLXXVI.)

In many of the examples which have been adduced, the substances, so excreted, are finally converted into a vascular and otherwise organized body, making an integrant part of the original frame, by the general laws of which it is regulated.

(CCLXXVII.)

In other instances, these substances may be considered as extraneous; in which case they may either remain quiescent, or excite corresponding constitutional efforts for their removal.

(CCLXXVIII.)

Of the state of quiescence we have an example in the long continued indurations, before mentioned, which often follow gouty paroxysms.

(CCLXXIX.)

Of the efforts towards the removal of indurated albumen and fibrine, the first and most simple is by the process of absorption, which is often carried on

in the most slow and gradual manner, exciting no sensible disturbance in the part or in the system. Such a change is every day exemplified in the removal of opacities of the cornea, the disappearance of chronic indurations of lymphatic glands, &c.

(CCLXXX.)

A second and more sensible process is that, by which parts, so indurated, are affected by inflammation either in themselves, or in their immediate neighbourhood; in consequence of which, they either suffer a destructive change of their entire substance, or are destroyed or thrown off by the affection of the adjacent parts. I have seen the first change occur in lymphatic glands; and the last is evidently produced by the application of arsenical caustics in the case of cancer.

(CCLXXXI.)

These are the chief phænomena which occur to me as connected with the process of inflammation by the simple effusion of serum and its constituents. The subject will admit of farther illustration, when we come to specify the several diseases in which such effusions take place.

(CCLXXXII.)

As, in these instances of inflammation, one part of the blood is extravasated, so, in some other cases, Entire Blood, including its red globules, is poured out of the vessels, apparently by exhalation alone.

We see this in the bloody spots or streaks accompanying the mucous or other sputa in bronchitis and pneumonia.

(CCLXXXIII.)

In other instances of this kind, a small proportion only of red globules seems to be effused, giving the sputa a bright orange colour, arising in part from dilution, and probably in part from a great degree of decarbonization of the red part of the blood. I have not, however, read of any chemical examination of such sputa; so that the nature either of the colouring matter, or of the diluting fluid, has not been ascertained.

(CCLXXXIV.)

In both these examples of slight expectoration of blood under pneumonic inflammation, the appearances specified are the usual signs of a favourable termination of the malady.

(CCLXXXV.)

Blood, however, in pulmonic inflammation, is often fatally effused from the exhalants into the substance of the lungs.

(CCLXXXVI.)

In inflammation of the liver, blood is also, with no happier event, sometimes extravasated into the pori biliarii; whence it passes through the ductus communis choledochus into the alimentary canal.

(CCLXXXVII.)

Even serous membranes themselves, as the pleura and peritonæum, in a certain stage of inflammation, sometimes exhale entire blood. This process, however, seems confined to a period nearly coincident with death, and probably continues for some time after it; so that the quantity of blood, found on dissection, much exceeds that which was effused during life.

(CCLXXXVIII.)

A third product of inflammation is the fluid called Pus. It was long ago the opinion of pathologists, that entire blood, even subsequently to extravasation, is capable of being converted into this fluid. The question is extremely difficult to determine; because from the almost impossibility of obtaining pus in a pure state, its distinguishing characters have perhaps not yet been ascertained. What we know of it is chiefly as it is either produced within soft parts, in cavities formed after inflammation, and constituting what is called Abscess; or more superficially in parts which shew open erosion, denominated Ulceration; or, lastly, in the state of extravasation from unbroken inflamed surfaces. In the two first cases, it is mixed with cellular and vascular substance, and perhaps with some unchanged contents of the vessels; and in the last, with the specific fluids exhaled or secreted by the membranes, from which it is furnished. Hence, when pus is poured out from unbroken serous membrane, it would probably be mixed with serum; and with mucus, when from

membranes called mucous, such as those which line the generality of the internal receptacles and passages, throughout the body.

(CCLXXXIX.)

Of late, pus has been considered as being characterized by its solubility in concentrated acids, from which it is capable of being precipitated by water. By a still later writer it is said to be distinguishable by containing a great number of minute spherical particles, discoverable by the microscope; these particles being specifically heavier than water, and incapable of solution in it at a boiling heat.*

(CCXC.)

According to the opinion of BERZELIUS, not only the matter of abscess, but certain products of inflammation of unbroken surfaces, as the yellow fluid expectorated during the cure of pneumonia, are equally pus, formed in the secretory exhalants from entire coloured blood carried into them.

(CCXCI.)

Of this theory, as of that of GABER before stated, it is a strong confirmation, that, in cases of hemiplegia, in which blood is effused into the medullary substance of the brain, that fluid may be seen in all the intermediate states from entire blood, through what in appearance exactly resembles pus, to complete absorption.

* PEARSON. Philosophical Transactions, 1810, p. 294.

(CCXCII.)

The process of termination of inflammation in broken parts, by the production of pus, is well known under the name of Suppuration.

(CCXCIII.)

I am not aware that any chemical examination has been made of the different kinds of matter, which, after having exsuded on the skin, or, being contained in vesicles of different qualities, form scabs or crusts, as in erysipelas, lepra, and other disorders called Cutaneous. It is, however, evident, that all of them are results of inflammation; of which they either entirely terminate the existence in the part, or, at least, what may be called that paroxysm or fit, the form of which these maladies are so much disposed to assume.

(CCXCIV.)

On a great variety of occasions, the effect of inflammation is to increase the natural secretion of the parts affected, or those of the vicinity.

(CCXCV.)

Thus, in prosperous terminations of inflammation of mucous membranes, the fluid called Mucus is much increased in quantity. In this manner, in a catarrh there is a copious running from the nose; which often extends itself, by continuity of cause, to the membrane lining the trachea and bronchia. In bronchitis, which is a higher degree of the same

inflammation in the latter part, great discharges of this fluid follow. In gastritis, mucous vomitings occur; after enteritis, copious mucous stools. In cystitis, a similar fluid is mixed with the urine. In vaginitis, fluor albus is observable. In inflammation of the urethra, mucus is secreted from that membrane; &c.

(CCXCVI.)

The nature of mucus itself has not been well ascertained, and, according to BERZELIUS, differs in different parts, relatively to the purposes which that fluid is intended to answer. Conformably to his description, it contains, mixed with serum, which is almost void of albumen, a solid body, "which has the "property of swelling in water, and becoming a tough "half-liquid mass, which, however, is not dissolved "if more water is added, and which may be deprived "of its water by placing it on blotting paper, and "thereby rendered more dense."* The crusts which, in a slight common coryza, form within the nose, seem to be this solid substance, together with some of the constituents of the serum, deprived, by evaporation, of the watery parts.

(CCXCVII.)

Under certain degrees of inflammation of this membrane, the substances excreted are not always

* View of Animal Chemistry. English Translation, p. 58.

mere mucus. From the appearance of what is sometimes poured out, we may also presume it to be, not pus, as in the instance of the discharge from the bronchia, before mentioned, but even nearly pure serum, with all its constituents. Thus in cystitis, I have seen masses of a ropy, semi-transparent, jelly-like substance, ejected with the urine, at one evacuation, in the quantity of more than a pound. This was probably albumen; which, at that period, animal chemistry scarcely furnished the means of discriminating. From the appearance of the fibrous and curdled stools of children, and the consistent concretes, taking on the tubular form of the intestine in adults, which are often evacuated from the bowels in slight inflammatory affections of the mucous membrane of the colon and rectum, one should incline to suppose these substances, so often mistaken for worms, to be rather coagulated albumen, than hardened mucus. In cynanche tonsillaris, the mucous membrane of the internal fauces, and in cynanche laryngea, or croup, that of the larynx, is often lined with crusts, which seem to consist chiefly of fibrine.

(CCXCVIII.)

The conclusions as to the chemical nature of various substances adduced in the last paragraph as resulting from inflammation, are drawn merely from the general appearance of these substances; no accurate chemical examination of them having, so far as I know, been hitherto made.

(CCXCIX.)

We are equally ignorant of the chemical nature of those films, which are sometimes discharged from the vagina, putting on the exact form of the internal cavity of the uterus, from the surface of which it is probable that they were exhaled in a more liquid state.

(CCC.)

The existence of these several substances proves the general principle of evacuation in the case of inflammation, and may suggest to those who have time for experimental chemistry, objects worthy of their investigation.

(CCCI.)

Among other increased natural secretions from local inflammations are,

First, in ophthalmia, a flow of tears; which, in their chemical qualities, are said greatly to resemble the mucus of the nose.

Secondly, in inflammation of the gums, tongue, throat, and ears, an increased discharge of saliva.

Thirdly, in pleurisy and peripneumony, a discharge of mucus and pus from the membrane of the bronchia.

Fourthly, in peritonitis, an increased discharge from the mucous glands of the intestines.

Fifthly, in hepatitis, an increased secretion of bile.

Sixthly, in hysteritis, an increased evacuation of blood by the vagina; which, in old women, long past

the natural time of menstruation, sometimes recurs at regular monthly periods.

Seventhly, in gout and rheumatism, sweating.

(CCCII.)

Perhaps, also, serous discharges themselves should have been classed under this head, since they are for the most part the products of textures fitted by nature, even in a healthy state, to secrete them. As, however, in many of such cases, the fluid seems not only to err in point of quantity, but to have undergone various changes in the proportion of its constituent parts, it has been convenient to consider such discharges under a separate head.

(CCCIII.)

With regard to these various evacuations from parts actually inflamed, or from their neighbourhood, I do not mean to assert that all of them constantly occur. It must, however, be admitted that some of them always, and others often, do so; and, in that case, they accompany, in the relation either of cause or effect, the cure or relief of the malady.

(CCCIV.)

Although, however, they may relieve the part which is affected, it does not from thence follow that they restore the patient to health. It may, on the contrary, happen that the means, which, according to the laws of animal life, cure the disease, may kill the patient. This is the case with regard to the effusion

of blood, either into the parenchyma or cells of the lungs, which often occurs in peripneumony; and it is often true in the effusion of fluid into the ventricles of the brain in hydrocephalus. The theory of the curative principle is nevertheless just; and the process, in a great majority of cases, is beneficial to the animal frame.

(CCCV.)

Among the fluids, which are effused from inflammation, we may reckon that cream-like substance, which is deposited in the cavities of joints, in capsular ligaments, in the sheaths of tendons, among the fibres of tendons themselves, and in various parts of the cellular membrane, which, by the absorption of the thinner parts, becomes what is generally called Chalk-stone. In this harder state it is sometimes found lining, like a crust of smooth gypsum, articulating surfaces, and attached to, or deposited instead of, the synovial membrane. It is well known as a common effect of highly inflammatory gout; and, according to the accurate Dr. WOLLASTON, consists of urat of soda.

(CCCVI.)

The concretions sometimes coughed up by patients labouring under pulmonary consumption, or found in their lungs on dissection, are said by FOURCROY and Dr. THOMSON to be phosphate of lime. As I have in my possession some portions of a substance apparently similar, which were ejected with purulency

from a cervical gland of one of my patients, it is probable that the pulmonary concretions are also formed in glands from a process of slow inflammation.

(CCCVII.)

It is very common to find hard laminæ attached to the arteries, especially the aorta and its larger branches. These laminæ are always, so far as I have observed, formed in the cellular space between the inner and fibrous coat; and are said by HALLER to be deposited of a creamy consistence, after which they harden by absorption. They are, probably, true bone, or phosphate of lime. From certain circumstances attendant on patients, in whom they exist, I have reason to conclude that they are the result of an inflammatory affection of the vasa vasorum. When in the coronary arteries of the heart, they seem to be the usual predisposing cause of syncope angens, commonly called angina pectoris.

(CCCVIII.)

Laminæ of a similar appearance are sometimes seen in the falciform process of the dura mater.

(CCCIX.)

I have known portions of one hemisphere of the cerebellum converted into a hard bone-like substance, incapable of being cut with a knife. I am ignorant whether such concretions have been chemically examined; but as, in this case, there were scirrhosities in the brain, apparently of a scrofulous kind, and the

patient died of hydrocephalus internus, it is probable that the indurated mass was the result of inflammation, and similar, in its chemical qualities, to that of diseased lymphatic glands.

(CCCX.)

I have more than once observed very hard concretions of an osseous or stony nature in wombs, which have become greatly enlarged, and have had other marks of having suffered inflammation. We have, I believe, no account of the analysis of such concretions.

(CCCX I.)

With regard to these osseous and saline concretions, I am not aware of any constitutional process, by which they are capable of being removed, except that of suppuration; which we know is a frequent and most painful result of the formation of chalk-stone, or concrete urat of soda.

(CCCXII.)

That peculiar form of swelling, in a very common disease, to which Dr. HAYGARTH has given the name of Nodosity of the Joints, has not been chemically examined, so as to enable us to speak with certainty as to its nature or composition. It seems to be merely an erroneous deposit of common bone.

(CCCXIII.)

In a patient labouring under fever, with strong muscular pains, the bellies of the flexor muscles of

the fore arm, and various other parts, which were nearly of their natural size, had acquired a stony hardness and rigidity. The malady had the appearance of being ossification; but though the patient soon died, no dissection was obtained.

(CCCXIV.)

Hepatic concretions, said by the authors to be phosphate of lime, I have never seen to such an extent, as to enable me to form any reasonable conclusion whether they were the products of inflammation.

(CCCXV.)

To the head of inflammation previously existing in a more or less acute state, may probably be referred a considerable variety of those more or less permanent changes as to colour, transparency, magnitude, thickness, adhesion, &c.; of which have been given as examples in the serous membranes, the silvery whiteness or thickenings of the pleura and peritonæum. So many similar instances might be adduced by those, whose branch of the profession particularly leads them to the observation of local diseases, that we should probably not greatly deviate from the truth in inferring, that, where such changes are found after death, they have originated in previous inflammation. They have probably arisen from depositions of known excretions, erroneous as to place, quantity, or quality.

(CCCXVI.)

In the view which I have given above of the phæ-

nomena of inflammation, (CCXV.) it has been suggested, that the term is capable of producing error as to any actual condition essential to the supposed state, because it comprehends many stages, differing from each other in the existing actions or affections.

(CCCXVII.)

It is this confusion, inseparable perhaps from language, which was formed for vernacular use, rather than for accurate distinction of ideas, that has made it convenient to employ the expression Weak Inflammation, in order to distinguish it from what is more acute.

(CCCXVIII.)

If we enquire into this state from the quality and order of its actual phænomena, or natural changes, independently of any assumed influence of external agents, it will be fonnd difficult to arrive at any very decided notions on the subject.

(CCCXIX.)

We may perhaps conceive of it as of a kind of chronic state of increased fulness of vessels, in which the blood, when visible, has less of the florid hue than in the acute state ; the heat little exceeds the medium degree of the part affected ; and there is a disposition to few of those actions of effusion, which, conformably to the facts already stated, tend to remove the excessive fulness of blood in the part.

(CCCXX.)

That such a state exists, cannot be doubted; but it may with equal truth be asserted, that the extent, which has been assumed with regard to this condition, in all its relations, on one hand, and the defect of observation of its existence in certain cases on the other hand, together with the employment of those inefficacious and injurious theoretical measures, to which these circumstances have given rise, have exposed the profession to juster grounds of obloquy, than any other error within its entire field of reasoning or practice.

(CCCXXI.)

I have already observed (LI.) that, during life of adequate length, all arteries, when deprived of the blood which usually distends them, become impervious cords; and that the capillary arteries, after having been, in a state of inflammation, preternaturally dilated with blood, have a power of contracting themselves, so as to resume their natural state. (LXXII.) (CCXXVI.)

(CCCXXII.)

As this latter power seems to diminish, *cæteris paribus*, in proportion to the violence and duration of the distending cause, one can scarcely avoid considering the state, which follows, as what Dr. CULLEN would have called Collapse, consequent on undue excitement; and Dr. JOHN BROWN, Indirect

Debility. But whatever name may be given to this state, the order of facts is not the less true.

(CCCXXIII.)

The force and duration of the increased momentum, which are requisite to the production of this morbid effect, greatly vary in different constitutions, and in the same constitution at different times. A considerable degree is necessary in the early and middle periods of life, when all the powers of restoration are strong; and the sum of the two diminishes, *cæteris paribus*, as we reach the term of old age. Hence persons at the former periods are more capable of the salutary processes of resolution, adhesion, &c.; while those at the latter period are more subject to have inflammations terminate in mortification, or the death of the part, which, if it is a vital one, is immediately followed by that of the whole frame. Where also it is not vital, the constitution, exhausted, as it were, by its own efforts to throw it off, sinks, and the patient dies. Or if the evil do not reach to this extent, parts so affected are liable to tedious ulcerations, with discharges of a watery or bloody kind, indicative of affections altogether different from those, which accompany recovery.

(CCCXXIV.)

A state somewhat similar in kind, but different in its progress, is apt to occur in what, with technical barbarism, is called Irritable Inflammation; that is, in habits in which inflammation is easily excited, and

though slight, is readily exchanged for that which is characterized by a state of languor and inactivity.

(CCCXXV.)

It can, I think, scarcely be doubted, that it is this expression of what, in reality, are nearly opposite states in that series of phænomena which is called inflammation, that has given occasion to the assertion of the different microscopical appearances of quickness or slowness of circulation in that malady, either as occurring at different periods of the disease, or as produced by different external causes.

(CCCXXVI.)

It may, however, be observed, in passing, that neither the one nor the other state, though demonstrated, should serve as an infallible rule for the administration of remedies ; the operation of which is too complex, and difficult of observation, to admit, in our present state of knowledge, of that universality of application, which results from the systems of the schools.

(CCCXXVII.)

How far the different states, which have just been described, can be considered as salutary, we cannot on all occasions determine. In that of mortification, the local changes are certainly not conducive to the immediate health of the part; which is sacrificed, as something extraneous, and makes way for that which is new and more perfect. So far the process,

generally considered, is a salutary one; but the difference consists in this, that in many other circumstances of inflammation, the part restores itself by its own affections, and does not call on the constitution for the fatigue of acting; whereas, in that last mentioned, the part dies, and the constitution is called upon to supply its place. In the other kind of inadequate inflammation already noticed, which is called irritable, there also seems to be a disposition in the constitution to make amends for defective power in the part.

(CCCXXVIII.)

This law of the constitution, by which it rarely acts when the powers of a diseased part are adequate to the restoration of its own healthy functions, is observable on many important occasions, which will be remarked in the course of this work.

(CCCXXIX.)

These are the chief phænomena, and the order in which I have observed them to occur, in Inflammation.

DROPSY.

(CCCXXX.)

IN describing the effects of inflammation, I have already mentioned that one of its simplest and most common terminations is the extravasation of serum, or some of its constituents. Some important circumstances relative to that extravasation were however then omitted, having been purposely reserved to this place.

(CCCXXXI.)

We have seen above, (CCLIII.) that the swelling, which often accompanies the cessation of gouty paroxysms, is a true dropsy of the anasarcous kind; following, in free spaces, the direction of gravitation.

(CCCXXXII.)

Where, however, it is considerably extensive, it seems to rise against gravitation, relatively to the inflamed part.

(CCCXXXIII.)

We might, *à priori*, conceive this progress to be owing to the strength of expulsory power in the exhalants, overcoming, in a column confined all around, the force of gravity. Perhaps, in some instances, this may actually be the case.

(CCCXXXIV.)

Since, however, we find that, in gout in the foot, this œdema often continues to extend itself in proportion as the inflammation in the foot subsides, nay sometimes exists in the greatest degree, and to the greatest extent, long after all symptoms of local inflammation are gone; we cannot help attributing its occurrence in the latter case to such a state of momentum of blood still existing in the vessels leading to the part originally inflamed, as produces preternatural evacuation by exhalation.

(CCCXXXV.)

This being admitted, we may reasonably suppose that the anasarca, or œdema, stated to have risen to a considerable distance above the local inflammation, originated in a similar condition in the neighbouring arteries and exhalants; both of which appear, from all the phænomena in such cases, to be preternaturally distended with blood.

(CCCXXXVI.)

The existence of such a condition in parts supplied from the same arterial rami as those which go to the

inflamed spot, is indeed proved by this fact; that if, in cases of extensive œdema of the leg, following gout in the foot, and chiefly appearing after the leg has been long in a depending posture, we apply a tight bandage from the foot to above the ankle, we shall still find an œdematous swelling recur every night above the bandage, often in a greater degree than before the bandage was applied.

(CCCXXXVII.)

From this fact it follows, that the increased momentum, which is a leading circumstance in the phlogistic diathesis, is sufficient to produce anasarca or œdema, without the existence of local inflammation, as the source from which the effusion takes place.

(CCCXXXVIII.)

A convincing proof of the truth of this principle may be deduced from those œdematous swellings of the lower extremities, which often follow that highly inflammatory disease scarlatina, even when no rheumatic affection of the joints has intervened. Ascites, also, not unfrequently occurs under similar circumstances; and both these forms of dropsy evidently originate in the high phlogistic diathesis which then prevails in the system.

(CCCXXXIX.)

That such a state in reality often exists in anasarcous dropsy, of which it is the cause, though no previous local inflammation was observable in any part of the

system, appears from the quick pulse, of that peculiar bounding kind which accompanies rheumatic and gouty inflammation, the dryness of the tongue, the thirst, the paucity and high colour of the urine, and those marks of what is called inflammation in the blood, when properly drawn from the brachial veins, which are observable in patients so affected.

(CCCXL.)

The fluid effused in what are supposed to be idiopathic ascites, hydrothorax, and anasarca, is usually of a pale greenish yellow colour, considerably transparent; and has, I believe, all the chemical qualities of common serum.* It, however, greatly differs as to its degree of tenuity; having occasionally, in ascites, the consistence of a thick jelly, so that it is difficult to make it pass through the canula of the trocar in the operation of tapping. We may justly presume this viscidity to be owing to a superabundance of albumen.

(CCCXLI.)

The identity of the fluid, thus effused, with that which arises from certain degrees of inflammation in the same membranes, is certainly a strong argument in favour of a state in them approaching to the phlogistic diathesis.

* In a very recent example of ascites, probably of many years duration, the fluid removed by tapping, and amounting to fifteen beer quarts, exactly resembled in colour and consistence the thin coffee coloured liquid, which is often vomited up by patients, who have inflammation or ulceration of the villous coat of the stomach. The dark colour was probably owing to the admixture of blood.

(CCCXLII.)

In ascites and hydrothorax, indeed, we often find such a thickening and opacity of the peritonæum and pleura, unaccompanied with disease of the liver or any other part, as would justify us in inferring a previous topical inflammation in those membranes.

(CCCXLIII.)

In some cases of ascites, this inflammation proceeds in a slow chronic manner, with little or no pain, and sometimes with little fever; but a gradual and constant extravasation seems to be taking place.

(CCCXLIV.)

Such, indeed, with only occasional slight pains about the belly, and some symptomatic irregularity in the alvine excretions, is the usual commencement of ascites, where, as is very often the case, hepatic disease is wanting; so that the patient is scarcely aware of the existence of important disease, till he is alarmed by a preternatural tumefaction of the abdomen.

(CCCXLV.)

In the same manner I have seen hydrothorax slowly arise from a diseased state of the pleura, following slight inflammation; accompanied with habitual fever and high-coloured urine; but without the smallest affection whatever of the organs of respiration, till after the lapse of several months, when, at the end of a few days, the patient died,

and dissection exhibited copious serous extravasation, without any pulmonary disease.

(CCCXLVI.)

So, also, anasarca of the lower extremities is often preceded in them by local pains, which have not gone on to inflammation, and have subsided as the effusion has taken place.

(CCCXLVII.)

In such cases, we cannot reasonably expect to find the secreting membranes to be always in a morbid state: for here, as in acute inflammation, the exhalation is the cure, or the effect of the curative process, of the excreting parts. We cannot therefore wonder at the assertion of BICHÂT, but must admit it as conformable to the reason of the case, that, in increased secretions, the vascular system supplying the part is not generally found more full than on other occasions.

(CCCXLVIII.)

This position, however, though often true, is not always so. An increased flow of tears is usually accompanied with increased fulness of the vessels of the conjunctiva.

(CCCXLIX.)

The fluid found in the cavities of the brain in hydrocephalus is not serum, or, at least, contains little of it. It is not coagulable by heat or acids; though,

according to Mr. BRANDE, the action of the voltaic pile precipitates from it a very minute proportion of albumen.

(CCCL.)

It is worthy of attention that dropsy is often evidently produced, and, when existing, aggravated, by many of those circumstances which are known to increase the momentum of the blood. Thus ascites and anasarca often follow hard drinking, though there is no disease of the heart or liver. So, also, anasarca is frequently caused or increased by hot weather and hot clothing. Nay I have often seen, in anasarca of the lower extremities, the leg which was nearest the fire swell more than the other. On the contrary, such swellings are diminished by external cold.

(CCCLI.)

From all these circumstances it is probable, that, although serous effusions are usually the consequence either of local inflammation of cellular or serous parts, or, at least, of that state of those parts, which accompanies the phlogistic diathesis, yet they may occasionally exist from a degree of excessive momentum short of that, which would have been necessary to produce either of those two states.

(CCCLII.)

As the state of inflammation rarely occurs till some time after the increased momentum of blood has

taken place, (CXLIX.) so extravasation very uniformly obeys a similar law. This, conformably to a preceding observation, may be illustrated by the obvious example of sweating, which rarely supervenes till a considerable time after the increased action of the heart, from heat, exercise, &c. has begun to subsist, (CLXXXVI.)

(CCCLIII.)

This principle equally obtains, whether the increased momentum be general or only topical.

(CCCLIV.)

So also, on other occasions of increased momentum, as in the example of inflammation above explained, effusion is not always proportioned, either to the mere disposition in the capillaries of the part, or to the degree of increased momentum ; but is relative to the sum of the two taken together.

(CCCLV.)

Hence it will be found, that, in certain states of the capillary system, even the healthy impetus may be sufficient to cause effusion; while in other states, very great degrees will not produce the same effect either at all, or else only through the medium of local inflammation.

(CCCLVI.)

This principle will, I think, comprehend all the more essential examples of idiopathic dropsy, which

occur in the animal frame; as well those, which, conformably to common language, may be stiled Active, as those which are attributed to debility, and may be called Passive.

(CCCLVII.)

In this view, the malady in question, and the state of inflammation, throw on each other reciprocal light; since it appears that both have in common the circumstance of a degree of momentum of blood, which is excessive with regard to the whole, or a part, of the animal system in general, or of that particular animal, or accidental constitution of the animal, which is the subject of the malady.

(CCCLVIII.)

If the facts, which I have stated, be well founded, general dropsy, like the extravasations in inflammation, is to be considered rather as a salutary effort of the constitution to diminish morbidly increased momentum, than as a primary or actual disease; though in this, as in the former case, it may happen, that the effusion, occurring in certain parts, as in the ventricles of the brain, may, as I have before observed, prove fatal to the patient.

(CCCLIX.)

In this view we may understand both the efficient and final causes, why dropsy of various kinds may follow venous and glandular obstructions arising from different sources; the arterial blood, thus arrested in

its natural course, pouring out its serum through the exhalant extremities of the vessels in which it was contained.

(CCCLX.)

The salutary power of dropsical effusions in removing local morbid momentum having been, I think, sufficiently ascertained by the preceding observations; I have only to state in this place, that facts will hereafter be adduced to shew a similar power, in the same process, over general morbid momentum.

(CCCLXI.)

From what has been said, it will readily appear, that the phlogistic diathesis may not be essential to serous effusion, or dropsy; though few dropsies will probably be found to exist, without the appearance of the inflammatory crust in blood drawn from the arms of such patients, at some stage or other of the disease.

(CCCLXII.)

I say at some stage or other, because it is certain that an effused fluid may continue, though the circumstances producing the effusion have ceased.

(CCCLXIII.)

We may also, conformably to the principles above admitted, (XCVIII.) (CCLXXXVII.) (CCCXXIII.) conceive that easily yielding state of vessels, approaching to that of death, which, in order to the production of effusion, does not require

the coincidence of the excessive momentum usually accompanying the phlogistic diathesis.

(CCCLXIV.)

It may, however, be repeated, and the reader is requested continually to bear it in mind, as an important practical conclusion, that, in all these cases, the impetus is excessive with regard to the individual constitution; and therefore is speedily followed by that process of effusion, which, when in a just degree, it must be nevertheless admitted that nature employs as the most efficacious means of relief.

(CCCLXV.)

If to the explanation of dropsical effusions, which has thus been attempted, it be objected that accumulations of fluid may arise from diminished absorption; I answer, that, though such a cause is theoretically possible, the question is, whether it be actually true. My observation has not furnished me with a single fact, in direct proof of the agency of this cause; and one could with no shadow of reason attribute to it the many pounds of serum, which are sometimes effused into the abdomen in the short space of twenty-four or thirty-six hours. The arguments in favour of this cause deduced from the effects of remedies, the operation of which stands equally in need of proof, will not be admitted by any logical pathologist.

HÆMORRHAGE.

(CCCLXVI.)

IT has been seen above, that Hæmorrhage, or a discharge of blood, not unfrequently attends that of mucus, pus, or serum, from inflamed parts, as the bronchia, &c. and that a similar discharge sometimes follows hepatitis or acute inflammation of the liver. In such cases, it is evident that the discharge is the topical effect of that modification of increased momentum, which forms a part of local inflammation.

(CCCLXVII.)

That the same effect may also happen from general phlogistic diathesis, without local inflammation, is evident from the bloody urine, which is a common sequel of scarlatina, and an occasional one of measles; and as, in the former disease, we see this hæmorrhage forming one link of a series of effects, of which articular inflammation and dropsy often constitute other links, while under all these states there is a

quick pulse, and an inflammatory crust on the blood; we are justified in concluding, that all these phænomena are different effects of the same cause.

(CCCLXVIII.)

Thus, also, from seeing that, in this malady, anasarca or ascites is vicarious with hæmorrhage, we have new evidence in favour of the nature of dropsy, as before explained.

(CCCLXIX.)

Were any thing wanting to prove the vicarious relation of dropsy and hæmorrhage, sufficient proof might be found in the fact, which I have more than once witnessed, of violent, long continued, and most extensive anasarca, immediately, completely, and permanently cured by spontaneous hæmorrhage.

(CCCLXX.)

It is generally admitted, that what is called active hæmorrhage is accompanied with more or less of the phlogistic diathesis; the pulse being preternaturally quick and hard, the skin preternaturally hot, and blood, properly taken from the brachial veins, exhibiting the crust of fibrine common to acute inflammation.

(CCCLXXI.)

Under this phlogistic diathesis, we see blood spontaneously and largely discharged from the nose, the bronchia, the stomach, the bowels, and the uterus;

and, on many of these occasions, the blood is so florid, that one cannot well doubt its being arterial.

(CCCLXXII.)

Whether in such cases it flows from ruptured arteries, or the open extremities of capillaries, has been long debated, and never yet decided. There is, indeed, no reason to doubt that either may take place; and probable examples of both will be given as we proceed.

(CCCLXXIII.)

In the febrile state accompanying such disorders, the flow of blood through the radial artery is apt to have that sort of sudden, quick, short, and strong impulse, alternating with a comparatively long interval, which I have mentioned as accompanying vehement local inflammation. This pulse, being common to the more acute cases of hæmorrhage with those of dropsy and acute rheumatism, affords a farther proof of a like state of circulation in the three diseases.

(CCCLXXIV.)

Of hæmorrhage arising from the phlogistic diathesis there is one variety, unmentioned in that connection by medical authors. Of this malady I have already published two examples,* and since that time have seen many others. It is a modification of purpura,

* Edinburgh Medical and Surgical Journal, vol. v. p. 7.

exhibiting those appearances under the skin, which, from their size and shape, have been generally called petechiæ, maculæ, or vibices. They are usually flat, but sometimes considerably relieved above the rest of the skin. They are of different tints and shades of colour, from a pale red to a logwood purple, or even nearly the hue of a black currant. They do not become in any degree fainter from pressure, and are evidently ecchymoses, or spots of extravasated blood. Their chief, but not only, seat is the upper or lower extremities. In most of the cases which I have seen, they have followed or accompanied pretty severe pain in the limbs, which has sometimes had the form of articular inflammation. In one case, they made the third link of a chain, of which the two former were, first, hæmorrhage from the bowels, and next, acute rheumatism. In all the cases but one, there was fever; and, in all, venous blood taken from the arm was covered with the usual inflammatory crust of fibrine.

(CCCLXXV.)

It has been mentioned that these spots have often been either a symptom of acute rheumatism, or vicarious with it; but, that no doubt may remain of their being a common effect with dropsy, they were, in several cases, accompanied with anasarca, and one of the patients died some years afterwards with anasarca and ascites.

(CCCLXXVI.)

These spots were extravasations of blood into the

cellular membrane; probably by anastomosis from exhalant arteries.

(CCCLXXVII.)

In vomitings of blood of different shades of redness, or blackness, where the stomach is not ulcerated, dissection rarely shews any rupture of vessels; but frequently a great number of vessels in the villous coat are preternaturally distended with blood, which sometimes seems extravasated in patches in the substance of that coat itself.

(CCCLXXVIII.)

In many of the examples of recent hemiplegia, in which blood is effused into the medullary substance of the cerebrum, the medulla, to a small distance around, is found full of bloody points opening into the ruptured part, as if the exhalants were distended with blood. On the other hand, I have known hemiplegia, from a large extravasation of blood into the medullary substance of the brain, so rapidly follow a sudden and violent palpitation of the heart, that one might be apt to imagine such an effect to have originated in the immediate bursting of one or more blood-vessels. The truth could not, however, be ascertained, the patient not dying till several weeks afterwards.

(CCCLXXIX.)

In several of these cases of hemiplegia from sanguineous effusion, the patient is, to all appearance, in

such a state of previously good health, and the attack is so sudden, that one can hardly suspect the existence of phlogistic diathesis.

(CCCLXXX.)

So, also, with regard to many other hæmorrhages; which can scarcely be considered as owing to any other cause than simple excessive momentum, acting, perhaps, on vessels previously disposed to be so affected.

(CCCLXXXI.)

That hæmorrhage may arise from general excessive momentum alone, as an exciting cause, is evident from many other facts. If, when a vein in the arm is opened, in the common process of blood-letting, the blood does not flow, it may often be made to do so by external heat, by volatile, spirituous, or hot drinks, or by muscular exercise. Globules of blood are often effused, with the sweat, in the axillæ of young persons, after long and violent exertions. In many persons at an early period of life, and apparently free from disease, strong exercise, late hours, close rooms, or exposure to the violent heat of fires or of the sun, will produce bleeding at the nose. The same effect is sometimes observable in older persons from hard drinking; and I have known it occur from violent anger. Sanguinis, a naso fluxum, fere lethalem, juveni, a coitu prima nuptiarum nocte sæpius repetito, accidisse novi. It is not uncommon for children to bleed at the nose from vomiting; and

from the nose, eyes, and ears, from violent fits of whooping cough. Similar effects are produced by violent concussions of the head. In strong fits of epilepsy, blood is frequently driven to the extreme vessels with such force, as not only to fill, for a considerable time, numerous colourless capillaries, but even to form various effused spots and other ecchymoses.

(CCCLXXXII.)

In some of the instances of spontaneous hæmorrhage from the nose, the flow of blood is so rapid and copious, that one cannot help supposing it to arise from some small ruptured artery; which might easily be the case on a surface so vascular and exposed as that of the inside of the nose.

(CCCLXXXIII.)

It is probable, also, that a similar rupture is the cause of those sudden deluges of blood, which come up from the lungs, of a florid red colour; and which, from the nature of the part from which they originate, cannot possibly have stagnated where they were first effused.

(CCCLXXXIV.)

Although many of these cases are unaccompanied with a phlogistic diathesis, the greater number are of such a kind, as will probably be admitted as examples of active hæmorrhage, arising from excessive momentum of blood.

(CCCLXXXV.)

What, however, shall be said of those other cases, which are usually denominated passive hæmorrhages; such as those, in which the blood is considered as being in a state of peculiar weakness or dissolution, as in the petechiæ and other hæmorrhages of typhus, in the spots, dark urine, and sanious oozings from the gums, &c. in sea scurvy?

(CCCLXXXVI.)

It is necessary to observe here of hæmorrhage, as before of dropsy, and of the discharges after inflammation, that such a symptom rarely follows the increased momentum which produces it, until the vessels of the part, from which it takes place, have, as it were, offered a long and ineffectual resistance to the impulse of blood.

(CCCLXXXVII.)

So hæmorrhage, like inflammation or dropsy, is not directly as the local disposition in the vessels, or as the degree of the momentum of blood; but in a ratio compounded of the two. Whence it follows, that a great degree of momentum may be required in order to produce hæmorrhage in vessels which are little disposed, while a slight degree will be sufficient in vessels which are strongly disposed. These, therefore, are the two states which constitute active and passive hæmorrhage.

(CCCLXXXVIII.)

It has been observed above, (XCVIII.) that, in bodies at a certain period after death, the tonicity of the exhalants is so perfectly lost, that they not only admit blood, but allow it to exsude from their orifices into the cellular membrane, and the cavities of the thorax, abdomen, &c. by the mere force of gravitation. This may be considered as the extreme of atony in the vessels.

(CCCLXXXIX.)

In much less degrees of vascular atony, we may conceive the usual impulse of the heart sufficient to overcome the resistance opposed by the tonicity of the exhalants, and thus allow blood to be effused. A state similar to this in kind, though less in degree, seems to occur with regard to some of the contents of the exhalants, in the cold sweat which bedews the surface of the body, especially about the head, in syncope; and also in that, which is observable in many cases a short time before death, but which diminishes with the decline of the impulse of circulation.

(CCCXC.)

Hence then it appears, that, even in passive hæmorrhage, an impulse or momentum of blood exists, which, though not greater than what is usual and natural, is excessive relatively to the state of the exhalants in that individual case, which is the subject of the malady.

(CCCXCI.)

Of the course of symptoms in sea scurvy, I am totally incompetent to speak, having never seen more than three or four patients labouring under that malady. But it would be well worth while for persons of adequate talents and opportunities to examine, whether, at a certain period even of that disease, there be not evidence of such an excessive momentum, as may ultimately produce those effects, both on the solids and fluids, which are recorded as characteristic of that disorder.

(CCCXCII.)

A conclusion favourable to such an hypothesis would be furnished, not only by the example of inflammatory purpura already suggested, but by the petechial spots even of typhus itself: for I know, that, in the latter disease, petechiæ are usually the result of undue action of the heart upon skins suffering an accumulation of heat from various causes, aided by alcohol and other stimulating ingesta, and, at certain periods, accompanied with an inflammatory crust on the blood. To which may be added, that, under the due treatment of typhus, petechiæ are probably more rare in that disease, than in fevers of a purely inflammatory type.

(CCCXCIII.)

According to Brown, the long continued uterine hæmorrhages of the poor at an advanced period of life are to be considered as of the passive kind.

(CCCXCIV.)

With regard to Venous Hæmorrhages, such as are clearly seen to arise from the vena saphæna and hæmorrhoidal veins, the theory is by no means well ascertained; though it is probable, that, were the subject prosecuted with due attention, it would not be difficult.

(CCCXCV.)

The varicose state of the saphæna, giving occasion to such hæmorrhages, often occurs in pregnant women, in whom it is probably owing to the pressure of the uterus on the iliac veins. The same effect sometimes arises, in females, from the habitual strong pressure made round the hips by the straps of trusses worn for the relief of inguinal herniæ. In these cases we may conclude that the dilatation depends on mechanical obstruction to the free passage of the venous blood.

(CCCXCVI.)

But the disease also occurs in men, sometimes even before the middle of life, and without any assignable cause ; the vein becoming beautifully tortuous.

(CCCXCVII.)

In cases of this kind, so far as I have observed, there seems to be no real retardation of the blood in the vein; for on compressing it in any part, and rubbing the blood upwards out of the vein, the blood

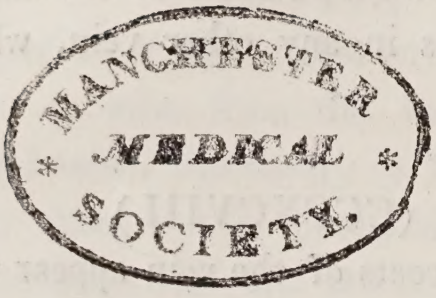
from below follows the removal of the finger with as much velocity as in any other vein, which is not diseased.

(CCCXCVIII.)

As, also, the coats of the vein appear to be thickened, there is reason to conclude that a diseased state of them is the cause of the morbid dilatation, and of the hæmorrhage which sometimes occurs in such cases.

(CCCXCIX.)

Of the rationale of hæmorrhoidal discharges no observation of my own has enabled me to speak; but the subject, in some of its views, has been well illustrated by Mr. ABERNETHY.



FINAL CAUSES of INFLAMMATION, DROPSY, and HÆMORRHAGE.

(CCCC.)

IN the preceding pages an attempt has been made to shew a coincidence of action or affection between Inflammation, Dropsy, and Hæmorrhage, inasmuch as each of them is the consequence of excessive momentum of blood, whether absolute or relative.

(CCCCI.)

It has also been shewn, that, in inflammation, the affection may be either simply local, or it may be local, producing or depending on general excessive momentum.

(CCCCII.)

As when, in the first case, the actions or affections of the part remove the local malady, so, on many occasions of excessive general momentum, the local disease has a tendency to relieve the general momentum.

(CCCCIII.)

Whether this change is owing to the immediate power of local inflammation as such, or to any other cause, is a question, not less interesting in a practical than in a speculative view.

(CCCCIV.)

It has been above stated, that the great stimulus to the heart's action is the blood ; and that a degree of fulness in the vessels, which is not always the same, but relative to the condition of the constitution, is necessary, in order to maintain the due action of that organ. That action is increased, on one hand, by a quantity of blood, which is, within certain limits, excessive ; and it is diminished, on the other hand, by a quantity, which, within certain limits, is defective. The truth of these principles will appear from the state of the pulse under that evident fulness of the arterial and venous systems, which follows full living, and the immediate change of that state by the simple process of blood-letting.

(CCCCV.)

These circumstances render it probable, that one of the ends to be answered, in such cases, by the supervention of local inflammation, is, in various ways, to evacuate and soothe the constitution, which was before unduly stimulated by excessive vascular fulness.

(CCCCVI.)

In this way we may, in part, conceive of the salutary

influence of gout on certain constitutions, either originally or ultimately subject to excessive sanguineous momentum.

(CCCCVII.)

If, however, such constitutions are capable of being relieved from an erroneous or defective performance of their due functions by gout, they are equally benefited by several other affections, some of which are of the inflammatory kind.

(CCCCVIII.)

Thus, some persons experience precisely the same relief from erysipelas, or other cutaneous eruptions; to which they are as habitually subject as gouty patients to inflammation of the capsular ligaments of joints, or fascia. Nay, such is the similarity of effect in these cases, that patients of this description have sometimes one of these complaints, and sometimes the other; and both with the same relief.

(CCCCIX.)

So, also, with regard to certain hæmorrhages. Many persons experience a great alleviation of various complaints, such as occur from defect of gout, by a bleeding at the nose, or an hæmorrhoidal discharge. Nay, examples have occurred, in which a patient, accustomed to vernal gout, and missing the usual fit, has had erysipelas, the next spring hæmorrhoids, and the following spring a fever, cured by blood-letting; each with equal relief to the constitutional symptoms.

(CCCCX.)

Precisely the same effect has, in my experience, been more than once produced by anasarcous swellings of the lower extremities, which have occurred at the usual season of gouty paroxysms.

(CCCCXI.)

These circumstances shew one common alleviation of constitutional errors of circulation, by local inflammation, hæmorrhage, and dropsy; and therefore afford a strong additional proof of the general resemblance of action or affection in the three diseases.

(CCCCXII.)

So, also, on various occasions, not only local disease, as before mentioned, but increased action of the heart, is relieved by dropsical effusions. Thus, even in hectic fever, I have seen a pulse habitually reaching 120 or 130 in a minute, reduced in a few hours to 60, by the supervention of violent anasarca in the lower extremities.

(CCCCXIII.)

I have, indeed, so often known constitutional maladies suspended, and life evidently lengthened and rendered more comfortable, by the coming on of different dropsical effusions; and, on the contrary, so many persons suffer aggravations of disease, or even death, very shortly after the spontaneous disappearance of dropsy; that I cannot avoid considering that effusion as a salutary process, rather than as an actual

disease. Every physician of extensive practice, who shall without prejudice review his own experience in this respect, will doubtless agree in the truth of this principle.

(CCCCXIV.)

This point, like a great number of others in pathology, is of the highest importance, not only in speculation, but as it directs or sanctions modes of practice so active, that they must be either essentially beneficial on one hand, or highly injurious on the other.

(CCCCXV.)

Although the reduction of plethora, by these natural processes, may be one mode by which they relieve the constitution from a predisposition to disease, it seems not to be the only or most immediate one. The farther consideration of this subject, in various connections, will be hereafter resumed at considerable length.

(CCCCXVI.)

The coincidence of hæmorrhage with dropsy is by no means a frequent occurrence. It does, however, occasionally, under different forms, exist. I have seen a long continued and large hæmorrhage from the lungs accompanied with hydrothorax, anasarca, and ascites, and with a pulse of 136 in a minute. All were relieved together, and the patient was restored to health, as soon as, by digitalis, the pulse was reduced to 40 in a minute.

(CCCCXVII.)

It is more usual that dropsy follows hæmorrhage; in which case the former is, I believe universally, considered as the immediate consequence of the latter. This opinion must be received with restriction. Where both are spontaneous, as they arise from a similar condition in the constitution, or the part, it cannot be wondered at that they should occur in succession to the same patient. It however appears to me that dropsy is not the immediate effect of hæmorrhage, but of the cessation of it. Where also the hæmorrhage is accidental, but in some degree habitual, the dropsy arises either from a similar cessation, or from too sudden nutrition; both of which produce excessive plethora or over stimulation, often by the means employed to arrest the malady, and restore the strength, which the hæmorrhage was supposed to have impaired.

(CCCCXVIII.)

The greater the hæmorrhage relatively to the resisting power of the patient's constitution, the more readily will these measures be followed by effusion.

(CCCCXIX.)

In this respect, dropsy agrees with all the modifications of inflammation; which, as I have before stated, is often created, where it did not exist, or reproduced, where it had previously existed, by a too sudden return to nutritious or stimulating food or

drink, or the application of great heat, after long febrile affections, or other diseases, under which muscular strength and flesh have been greatly reduced.

(CCCCXX.)

Precisely the same phænomena occur with regard to hæmorrhage, which is a very common effect of the prevailing attempt to restore strength by full and stimulating diet, after long discharges, or other extenuating processes.

(CCCCXXI.)

Enough, probably, has now been said to shew the nature of inflammation, dropsy, and hæmorrhage, and to prove the analogy which exists between them, relatively, first, to their phænomena, secondly, to their exciting causes, and, thirdly, their influence on the constitution.

(CCCCXXII.)

The last head of resemblance will admit of a great number of additional proofs and illustrations, as we proceed in our inquiries into the nature of the various other processes, which attend the animal frame, in health and sickness.

SIMPLE EXCESSIVE DETERMINATION, or FULNESS, of BLOOD.

(CCCCXXIII.)

AFTER the circumstances denoting acute inflammation in a part have subsided, we still observe in it some phænomena, which carry with them evidence of similar affections or actions.

(CCCCXXIV.)

Thus we have seen that dropsical effusion will continue to take place from the part, or its neighbourhood, after the subsidence of the local symptoms of inflammation.

(CCCCXXV.)

It is, however, of importance to remark, that this is also true with regard to the sensations; for pain, either constant or occasional, will occur in gouty limbs long after the fit is gone, and no inflammation or other disorder of the part can be discovered. I have known such pain continue or recur for months, attended with a strong and occasionally quick pulse,

and turgid veins; and these symptoms have been immediately removed by a single moderate bleeding, although the blood, taken in the most favourable manner, has shewn no inflammatory crust, or any other deviation from its healthy appearance.

(CCCCXXVI.)

In this case, then, it will readily be admitted, that there existed an increase of momentum, short of inflammation; and that the pains were justly attributable to that cause.

(CCCCXXVII.)

Pains of various other parts, which will be more particularly specified, and therefore explained, as we proceed, appear to originate in the same increased momentum of blood.

(CCCCXXVIII.)

This momentum, producing excessive impulse on susceptible parts, seems to be one of the chief causes of what may be called idiopathic pain in the animal frame. Perhaps, indeed, exclusively of inexplicable nervous sympathy, there would be some difficulty in pointing out any cause of the production of pain, except impulse; since pressure, bruising, tearing, cutting, stretching, suction, and probably all chemical operations are mere modifications of that power.

(CCCCXXIX.)

Even pain itself, simply existing, has a tendency to

diminish the action of the heart, and, therefore, that increased momentum or fulness of blood, which seems to produce it.

(CCCCXXX.)

Besides pain, there are other evidences of increased fulness of certain vessels; which fulness, the velocity of the blood being given, implies, as I have already observed, increased momentum or determination. Such evidences are, swelling, increased heat, or redness; and occasionally all three.

(CCCCXXXI.)

It will at once be perceived, that these are the very symptoms, by which it is customary to characterize inflammation itself.

(CCCCXXXII.)

Hence will appear the justice of the remark, in a former part of this work, that inflammation is by no means accurately defined by the symptoms usually attributed to that state.

(CCCCXXXIII.)

That very resemblance itself justifies us, however, in inferring, that in many other maladies, in which these circumstances exist, there is a condition common to them with inflammation; which condition is excessive momentum or determination of blood to the part or parts so affected.

(CCCCXXXIV.)

The chief difference in the two states seems to consist in this, that where there is no inflammation, the momentum or determination of blood is not so great, relatively to the capillary vessels of the part; which, therefore, do not suffer the same affections or actions.

(CCCCXXXV.)

Since, however, on various occasions, which will hereafter be particularised, the two states vibrate backwards and forwards into each other, so that in an affection of the same part, and even during the same fit of indisposition, what is one day simple excessive momentum or determination, shall be inflammation another day, and *vice versa*, this is itself a strong proof of one common condition in the two cases.

(CCCCXXXVI.)

Were we, in our present state of knowledge, capable of pointing out the symptoms peculiar to the different textures, which are the subjects of these excessive determinations of blood, the specification of the several diseases might be properly arranged under such a classification.

(CCCCXXXVII.)

Even amidst the imperfection of my own knowledge on this subject, I would wish occasionally to avail myself of some arrangement of that nature; leaving to others, who are better informed than

myself, the task of supplying my deficiencies and correcting my errors.

(CCCCXXXVIII.)

In the serous and cellular textures, extravasation seems to be so easy, that few instances of increased determination to their vessels take place, without either inflammation or effusion. Of these effects, many examples have already been given under their respective heads.

(CCCCXXXIX.)

Under that of effusion, perhaps, certain other morbid appearances should strictly have been classed; such as, among the rest, that semi-transparent elongation and swelling, which we often observe to affect the uvula.

(CCCCXL.)

I have already marked the determination of blood, which takes place to the skin, and is accompanied with increased heat and redness, and followed by sweating, from exercise, external heat, and whatever increases the general momentum of the blood.

(CCCCXLI.)

Nothing is more usual than a preternatural redness, of different shades, on various parts of the skin of the face, from age, from the long influence of extreme heat or cold, from hard drinking, and even from hereditary constitution. From intemperance in drink,

the part most liable to be affected is the nose; in which the redness is often accompanied with risings and tuberosities of various forms and degrees, so as sometimes to produce great deformity. In consequence of the frequent connection between these effects, and the cause assigned, in common with those, which often attend disorders of the liver, some persons hastily infer, that wherever such appearances exist, the liver also must be diseased. This is erroneous. In all cases, the cause seems to be excessive determination of blood to the vessels of the cutis, which are often to be seen distinctly injected with that fluid. Accordingly, the redness is increased by heat, and diminished by cold, disappears temporarily from pressure, and totally from the loss of life.

(CCCCXLII.)

To what immediate cause are owing the following and other swellings, not necessarily accompanied with inflammation, whether they are mere determinations of blood to the cutis, or subjacent cellular membrane, or both, I am unable to decide.

(CCCCXLIII.)

It is not unusual to hear patients complain of local pains, apparently under the skin, accompanied with a sensation of more or less of preternatural heat, and soreness to the touch, but without swelling, redness, or fever. This state sometimes precedes erysipelatous inflammation, and sometimes exists, with that disease,

beyond the perceptible extent of the eruption; but it often occurs without any such appearance. In one patient, such pains have existed for several years, affecting various parts of the lower extremities; accompanied, when most violent, with fever of the inflammatory kind; and, during certain more aggravated paroxysms, wholly depriving him of rest. Another instance, somewhat of the same kind, and for many months inconsistent with comfort, especially during night, I have seen also confined to the lower extremities.

(CCCCXLIV.)

Other modifications of a somewhat similar kind, of which it is uncertain what texture is the immediate seat, and whether there be any cellular extravasation, are the following. In a Gentleman, a swelling without pain, or any constitutional affection, often began somewhere about the cheek or side of the face. In a few hours it extended itself, more or less, to other parts of the face; and in forty-eight hours or more disappeared, leaving the part in a state of perfect health. Any excess in wine would bring on a paroxysm, which was increased by the horizontal posture, and relieved by the application of cold. In a Lady, the tongue suffered fits of a similar disorder; a swelling and hardness in it beginning about the size of a pea, and in a few hours involving its whole substance, so as, at each attack, to threaten the patient with absolute suffocation, and then as quickly subsiding.

(CCCCXLV.)

Gouty patients, during what seems to be a perfect interval between actual paroxysms, often suffer such a degree of tenderness of the soles of the feet, as almost to deprive them of the power of walking.

(CCCCXLVI.)

Young females, labouring under the different modifications of what is called nervous disorder, frequently suffer much from pain and soreness about the sides, generally somewhat below the mammæ, without fever, or any apparent inflammation of the part. The seat of these symptoms, which often excite unnecessary alarm, appears to me to be, not the muscles, but the integuments of the thorax.

(CCCCXLVII.)

A great degree of pain and soreness about the head is, also, no uncommon complaint in nervous and other patients. From the parts of the head affected with this malady, it seems to be often seated in the membranous coverings. Sometimes it passes within the limits of inflammation. It is generally denominated a nervous disorder, and, though always difficult of relief, is peculiarly so under the false theory, which dictates the usual treatment.

(CCCCXLVIII.)

Another example of what, from the constitutional state of the patients to whom it occurs, is usually considered as being of the nervous kind, is a rather

sudden and painful swelling of one or both mammæ. I have seen it alternate with disorders of the head. In its cause it must be distinguished from that uneasiness or tumefaction, or both, which so often occur to females just before, or about the beginning of, the several menstrual periods ; or, more especially, when that natural discharge is, accidentally, in part or wholly defective. Though, however, they arise from different remote causes, these affections have many circumstances in common, and are occasionally accompanied with increased general momentum of blood.

(CCCCXLIX.)

This enlargement of the mammæ, from excessive sanguineous determination, will receive considerable illustration from the well-known process of lactation, in which the breasts swell conformably to the increased fulness of their vascular system, and the copious secretion of milk which they are intended to furnish. This state is also liable to run into that of inflammation, if, from any cause, as more particularly the defect of the usual stimulus to secretion, which is the sucking of the infant, the due evacuation of the arterial system of the part is not effected.

(CCCCL.)

Enlargements of the uterus, accompanied with a sense of weight and bearing down, and sometimes with various discharges, are not unfrequent. They are often unattended with fever, in many instances

afford no evidence of local inflammation, and frequently disappear, either spontaneously, or under medical treatment. It is worthy of remark, that, on some occasions, these enlargements increase, even to a great degree, just before the periods of menstruation, and diminish as the flow of blood proceeds.

(CCCCLI.)

In males, the prostate gland often suffers a slow and indolent swelling, without any marks of inflammation, or, I believe, of scirrhosity.

(CCCCLII.)

Other glands undergo similar temporary enlargements, hardly amounting to inflammation.

(CCCCLIII.)

But of all the examples of enlargements of glands, with scarcely any disposition to inflammation, or its common consequences, the most remarkable is that of the thyroid gland, constituting what is usually called goitres, or bronchocele. I have so often seen this swelling follow diseases of the heart, and other maladies, more especially those called nervous, such as epilepsy, &c. in which the blood is propelled with excessive momentum to the vessels of the head, and yet, at the same time, have observed such sudden augmentations and diminutions of the swelling, that I have suspected the gland itself to be intended as a diverticulum for blood disposed to flow with too great force to that important organ, the brain.

(CCCCLIV.)

That the liver is capable of suffering enormous enlargement, is often evident to the touch, even in young persons, after frequently repeated paroxysms of ague. In these cases, there is sometimes little or no soreness, and no pain, fever, or other sign of inflammation; and the part will return to its usual dimensions, and to the full performance of its natural and healthy functions.

(CCCCLV.)

From the seat of pain in certain cases, there is reason to believe, that a similar fulness of vessels, without inflammation, sometimes exists in the spleen.

(CCCCLVI.)

The vascular system of muscular parts appears, on many occasions, evidently to undergo a similar state. Thus, when that increased determination of blood to the lower extremities, which constitutes gout, is about to take place, the muscles leading to the part exhibit a previous proof of excessive momentum, by aching pains, and frequent contractions or cramps. The different branches of the saphæna at the same time shew preternatural fulness of blood. The same cramps, or aching pains, often accompany diarrhæa and cholera; in which there is an excessive determination of blood to the lower branches of the descending aorta. A similar excessive sanguineous determination seems to accompany the lassitude which affects the lower extremities from long walking, especially in hot

weather. In all the cases, the pains are increased by strong drink, and relieved by cold, either in form of cool air, or of various liquids externally or internally applied. They are often followed by œdema.

(CCCCLVII.)

On certain occasions, patients suffer another modification of this excessive determination of blood to the muscles of the lower limbs. Thus, after long confinement in bed, and under certain other circumstances, which will hereafter be mentioned, the aching pain in the legs, on rising, becomes so excessive, as hardly to be borne. That both this and the former modifications arise from one cause, which is increased fulness of the vascular system of the part, is evident from their being capable of being relieved, not only by cold, but often by the horizontal posture, and always by a tight bandage rolled round the leg from the ankle to the knee.

(CCCCLVIII.)

Females, whether about the age of puberty, or afterwards, when either chlorotic, or labouring under strong nervous complaints, are apt to suffer great palpitations of the heart on muscular exertions, which, though slight, are considerable relatively to their accustomed habits of indolence. In these cases, the palpitation produced by walking up stairs or up hill is accompanied with great uneasiness about the heart, and with very quick and short respiration; and the pulse, even during rest, will sometimes habitually

reach from 100 to 120 in a minute. The beating of the heart is usually felt at such a distance from its natural place, and there is often such a difficulty of lying on either side, that one cannot help concluding the heart to have suffered considerable enlargement. In such a case I have known absorption of two of the ribs carried to a considerable extent; and pressure with the finger on the heart through the yielding spot produced great anxiety, and immediate disposition to syncope. Yet this patient recovered; and now enjoys tolerable health, thirty years after the period of my attendance.

In other instances, the dissections of strong persons, usually after the middle of life, shew great and permanent enlargements and thickenings of the heart, without apparent inflammation.

(CCCCLIX.)

In these cases, as in others before mentioned, there is certainly a tendency to vibrate backwards and forwards between the states of simple fulness and actual inflammation; so that, in the latter state, the blood shall exhibit the usual inflammatory crust. Thus, in the changes which occur in the muscular substance of this important organ, we have another example of increased momentum or fulness, common to the two states of simple excessive determination and inflammation.

(CCCCLX.)

It seems, at first sight, curious, that increased

action of the heart should contribute to produce thickening or inflammation of its own substance. But this will not surprise those who consider, that this substance is supplied with blood by the coronary arteries, which arise just without the semilunar valves of the aorta, and are filled by each systole of the heart, returning their blood by the coronary veins into the right auricle.

(CCCCLXI.)

In the instances adduced under this head, there is great difficulty in deciding what cases owe their symptoms to excessive momentum of blood, and what to mere vascular distention: For here, as in the example of inflammation before discussed, we may easily conceive of two states or gradations of circulation, both constituting what is called disease, in which the vessels of a part suffer undue distention, and perhaps an error loci, from the blood, whatever may be, at that individual period, the force with which it is impelled. If in both these states there are certain common effects, the difficulty of distinguishing them is, by that very agreement, greatly enhanced. Thus, in both states, there may be an agreement, not only in excessive sensibility, but in actual pain, and more or less of swelling; while the heat of the part may not be increased, and there may be no mark whatever of local inflammation, or concomitant fever. This latter state may probably be, at a certain period of disease, that of the liver, spleen, uterus, &c. which I have just adduced; when we may suppose that

excessive momentum has, in a great measure, or quite, ceased, and the over distended vessels of the several parts are left to the free exertion of their tonicity, by which they are slowly to recover their wonted degree of contraction. Such a state seems to be one degree of chronic inflammation, as contra-distinguished from acute, in the manner before mentioned. All these states are, however, liable to be exchanged for that of acute inflammation, as already described.

(CCCCLXII.)

There are few textures throughout the animal system more liable to suffer increased determinations than Mucous Membranes. From their situation, they are indeed exposed to the constant influence of chemical and mechanical causes. This will be readily acknowledged, when it is considered that they line the passages for the air and food, and for the digestive and generative processes; during which they must necessarily suffer great vicissitudes as to the nature, duration, and degree of irritation from the substances with which they are in contact.

(CCCCLXIII.)

Let us first consider that part of the mucous membrane, which lines the passages for air in the process of respiration. And here it is observable, that the membranous lining of the mouth, which serves alike for the passage of air and food, and for the sense of taste, is different from that of the nose, which serves

for that of air alone, and for smell. Farther down in the fauces, and from thence into the œsophagus, and through the alimentary canal on one hand, as through the trachea and the whole extent of the bronchial cells, the internal membranous lining seems to have the same general properties.

(CCCCLXIV.)

Under the head of inflammation, mention has already been made of the catarrhal disorders of this membrane in the nose, &c. But it has not been hitherto, so far as I know, observed by medical writers, that a state of excessive determination of blood to the vessels of this membrane, though without inflammation, gives rise to some very common and important disorders.

(CCCCLXV.)

I have seen many examples of simple excessive determination to the membrane of the nose, producing all the symptoms of violent coryza, or cold in the head, without the least evidence of inflammation in the part or in the constitution, or of exposure to cold air. Some persons will suffer these symptoms by going into a hot room; others by agitation of mind. A female, of advanced age, had them uniformly produced by the internal use of hyoscyamus, to which she had otherwise no objection, and the taking of which, however disguised, she could constantly detect by this stuffing and cold in the head. At the time of the influenza in 1780, a patient, who suffered that

disease, continued for many months afterwards to have so violent a coryza, as to be affected with almost incessant sneezing, during which the discharge from the nose reached to an almost incredible extent. Every one knows that emetics, during their actual operation, produce an increased secretion from the eyes and nose. A young lady never took an emetic, without a long continued coryza immediately following that operation. In another lady, this symptom was sometimes the prelude of epilepsy.

(CCCCLXVI.)

It is well known how readily a coryza extends itself, by continuity of membrane, to the upper part of the trachea. Coughs are, therefore, a common consequence of colds in the head.

(CCCCLXVII.)

In patients who are subject to spasmodic asthma, fits of that disorder often begin with a violent coryza, in which the eyes become red and watery, and all the symptoms of a cold in the head are observable. After a few days, or sometimes even only hours, these symptoms suffer some degree of alleviation, and the malady proceeds to the bronchia, occasioning all the well-known signs of spasmodic asthma. What, then, is this state in the bronchia, but an affection of the mucous membrane of those cells, exactly similar to that which had previously existed in the same membrane in the nose?

(CCCCLXVIII.)

It may, however, be said, that asthma is a spasmodic affection, depending on causes acting on the mind, &c. and returning at regular periods.

(CCCCLXIX.)

But the sense of suffocation, which occurs in hydrothorax, and in certain diseases of the heart, also returns at regular periods ; and affections of the mind produce, aggravate, and renew, gout, acute rheumatism, hæmorrhage, and various other disorders, to which no one thinks of assigning the name spasmodic.

(CCCCLXX.)

The disease called spasmodic asthma is brought on by almost every thing which increases the action of the heart, and which stimulates and fills the vessels of the mucous membrane itself. Thus it is produced by intense heat, by lightness of air, by exercise, by full meals, by stimulating drinks, and by certain effluvia, as those of hay, whether new or old, of sealing wax, and other burning substances, and of ipecacuanha, while powdering, or even sometimes when a paper or bottle of it is opened in the same room with the patient. Of the operation of all these causes I have seen several examples ; and similar cases might doubtless be found in the writings or experience of other medical men.

(CCCCLXXI.)

On the other hand, asthma is relieved by gently

open bowels, by heavy air, by inhaling that which is cold, and by cooling drinks. It diminishes, as soon as mucous secretion begins to take place; and is more speedily and effectually relieved by spitting of blood.

(CCCCLXXII.)

These facts are convincing proofs of such a preternatural fulness of the vessels of the mucous membrane of the bronchia, as to impede free inspiration, and to produce all the symptoms of spasmodic asthma.

(CCCCLXXIII.)

But farther; in many of the cases in which certain effluvia, as those of ipecacoanha, hay, &c. produce spasmodic asthma, they usually, first, or at the same time, operate on the mucous membrane of the nose, in the manner already described. A case has also occurred to me of a female, who regularly once a week, for several years, had a fit of what, on the usual principle, might be called spasmodic coryza, affecting the eyes and mucous membrane of the nose only. The fit lasted for twenty-four hours, never extended itself to the throat or chest; and if, from any unknown cause, she one week missed the usual fit, she was sure of having it for double that period, or forty-eight hours, the next week.

(CCCCLXXIV.)

In order, however, to place this matter beyond all doubt, I would mention a patient, who, without pain or any other previous symptom of disease in the

thorax, died, in fifteen or twenty minutes, of a sudden attack of difficulty of breathing, without wheezing, and with every symptom of pure spasmodic asthma; and in whom, on dissection, there was found no effusion, or any other disorder, in the lungs or thorax, except an old adhesion, and a complete suffusion of a damask rose colour, amounting, in some patches, almost to blackness, of the entire mucous membrane of the trachea, and of all the ramifications of the bronchial cells, as far as could be traced. This part was examined in consequence of a prior expectation of the state in which it would be found; and no exsudation whatever bedewed, or was attached to, the discoloured membrane.

(CCCCLXXV.)

There can be no difficulty in understanding how a vascular fulness of the mucous membrane, lining the infinitely minute cells of the bronchia, should produce difficulty of inspiration by mere mechanical diminution of diameter, when we feel that such an affection of the same membrane in the nose sometimes makes it absolutely impossible for us to inspire through the capacious opening of the nostrils.

(CCCCLXXVI.)

Hence we see the absurdity of assuming asthma to be a nervous disease, produced by a spasmodic constriction of tubes, in the parietes of which no muscular fibres have ever been demonstrated, and no equivalent power of producing such an effect has ever been proved.

(CCCCLXXVII.)

Spasmodic asthma is rarely accompanied with much preternatural heat, though the pulse is sometimes quick. The oppression of breathing consists of a general sense of constriction rather than pain, which resists inspiration, and which the patient in vain attempts to overcome, by employing all the muscles which assist in elevating the ribs, and therefore expanding the thorax. It is, however, apposite to remark, that, in patients in whom the disease is habitual, it sometimes runs into the state of bronchitis, and has all the marks of an acute affection of that kind.

(CCCCLXXVIII.)

He, who shall consider the changes produced on this malady by mental emotions as fatal to the explanation which has been here given, betrays a great ignorance of the phænomena of the animal frame, and will, in the course of this work, see many other adequate proofs of the power of the mind over the capillary system.

(CCCCLXXIX.)

This discussion on the nature and proximate cause of asthma will clear the way for the knowledge of various other affections of mucous membranes, with equal impropriety called spasmodic.

(CCCCLXXX.)

Of this kind is one species of stricture in the urethra, said to depend, occasionally, on mental causes; and

which, probably, arises from a similar turgescence of the vessels of the mucous membrane.

(CCCCLXXXI.)

Since, also, persons, who have such strictures in the urethra, are peculiarly liable to similar affections in the lower part of the colon and the rectum, it is reasonable to suppose, that, in the latter disorders, strictures begin in the same way, that is, by an increased vascularity of the mucous membrane. It is true that, in the alimentary canal, there may be the coincidence of muscular contraction; and this may occur by that communication of malady between the two coats, which certainly often exists in cases of inflammation. As, also, it is found that simple stricture of the rectum is easily removable at the commencement of the malady, and becomes permanent and incurable only at a more or less late period, when long obstruction to the free passage of the excrements has given occasion to violent irritation, it is extremely probable that the permanence, which follows, is owing to a degeneracy of the strictured part into that inflammatory state, which produces scirrhus by extravasation, in the manner already explained.

(CCCCLXXXII.)

This theory is confirmed by the discharges of mucus and blood, which occur, and, for a time, relieve such strictures; giving occasion to their being sometimes mistaken for dysentery.

(CCCCLXXXIII.)

It receives also additional confirmation from what is found in the stomach, in which there can be no doubt that deep sorrow occasionally produces dyspepsia, and subsequent scirrhosity with its proper symptoms.

(CCCLXXXIV.)

That idiopathic dyspepsia itself is a morbid fulness of vessels of the villous coat of the stomach, will further appear from various circumstances. For,

First, its symptoms are those of increased sensibility; which, it has been before shewn, is usually attended with, if not produced by, increased vascular fulness, in whatever part the excessive tenderness occurs. Thus it suffers uneasiness from such a quantity or quality of food, as would produce no inconvenience whatever in other stomachs. It is customary to attribute this effect to the mere formation in the stomach of acetous acid, or the extrication of an unusual quantity of carbonic acid gas. But it is certain, that neither one nor the other of these substances will produce a similar uneasiness in the stomach of any healthy man.

Secondly, there is often a sense of burning or smarting heat, usually denominated heartburn, which evidently arises from increased turgescence of blood; just as preternatural heat is felt from increased determination of blood to other parts.

Thirdly, when vomiting occurs in dyspeptic stomachs, which are void of food, the fluid ejected is an unusual quantity of the natural mucous secretion.

Fourthly, all the symptoms of dyspepsia, as flatus, heartburn, &c. exist, in the greatest degree, in those cases, which are followed by vomiting of blood in different states; and it is found that these symptoms are often relieved by that discharge, and do not recur, at least in an equal degree, till a similar congestion of blood has taken place in the vessels of the stomach; after which, the symptoms are again relieved by another sanguineous vomiting. This case must be carefully distinguished from those, in which there is scirrhosity and ulceration of the stomach, and in which the blood is not a mere exhalation from the villous coat, but is poured out from eroded vessels.

Fifthly, as the state of dyspepsia with bloody vomiting is peculiarly incidental to females, who suffer obstruction of the menstrual evacuation; so other females free from that obstruction, but who labour under almost constant dyspepsia, with occasional vomitings of blood, are usually exempt from those symptoms during the periods of the menstrual discharge, but suffer relapses soon after the respective periods have ceased.

Sixthly, in that state of the tongue, so frequent in the West-Indies, in which the mucous membrane of that and the adjacent parts is affected with chronic inflammation, tending to aphthæ and separation, the stomach, apparently by mere extension of disease, suffers all the symptoms of flatus, acidity, &c. which are common to dyspepsia. A similar affection often reaches into the bowels; and is then greatly relieved by discharges of blood per anum.

(CCCCLXXXV.)

From all these circumstances, I judge dyspepsia, when it originates in the stomach, to be owing to a morbid turgescence of blood in the villous coat of that viscus.

(CCCCLXXXVI.)

A greater degree of this excessive determination would, probably, bring the malady within the limits of inflammation; and from the violence of the symptoms, and concomitant fever, I have reason to believe that I have more than once seen this effect actually happen from the use of certain ingesta, which, on other occasions, have produced only common dyspepsia. Of the truth of this fact I cannot, however, furnish the conclusive evidence of dissection.

(CCCCLXXXVII.)

If, therefore, it be true, first, that idiopathic dyspepsia is excessive vascular fulness of the villous coat of the stomach; secondly, that this state may be produced by mental affections; and thirdly, that it may easily run into the limits of slight inflammation; we may thus conceive the process by which mental affections may be followed by scirrhosity and subsequent ulceration.

(CCCCLXXXVIII.)

Hence we may also see, why similar effects may be produced by the long continued stimulus of spirituous liquors, and by mechanical injuries.

(CCCCLXXXIX.)

This discussion on dyspepsia reflects considerable light on the formation of stricture in the large intestines, and may also, perhaps, be applicable to many strictures in the œsophagus, which vary in their degree at different times, and some of which, whether treated by remedies or not, eventually disappear.

(CCCCXC.)

When we examine a state of vascular fulness, as it affects the mucous membrane of the intestines, we shall find other circumstances worthy of attentive observation. It is well known that certain medicines, called cathartic, when introduced into the bowels, produce an increased evacuation of fluids from their mucous glands. In particular diseases, a similar spontaneous purging of thin fluid takes place; notwithstanding which, at the same time, the whole abdomen is often so tense and sore, with a slow and wasting fever, that notwithstanding a part of the tension may be attributable to flatus, one cannot but believe the existence of some organic disease in the intestinal canal. This form of fever I have seen arise in marshy situations; and I should conceive it to be such as usually obtains the name of bilious, although, from the peculiar dryness of the air of this city, I am little acquainted with any of those diseases, which are usually attributed to the miasmata of marshes. The circumstance of a greater or less discharge of bile is, however, accidental, and not

essential; but from the symptoms in such cases, as well as from the relief which is obtained from brisk purging, although the matters discharged are not such as are usually furnished by any change produced on the fæcal contents of the canal, I am inclined to attribute the disorder to a morbid turgescence of the vascular system of the villous coat, and the relief to its complete evacuation by mucous, serous, or even bloody effusion.

(CCCCXCI.)

This state, which I have long conceived to exist in such cases, accords with what was, two or three years ago, suggested to me by a sagacious friend,* respecting the common symptom of black vomiting in yellow fever, and which arises merely from blood exhaled from the villous coat of the stomach and upper bowels. Hence it should seem that the yellow fever of hot countries, and the bilious of the more temperate, are both eventually gastric or intestinal fevers, originating in the same cause, and differing only in a degree, which is, probably, proportioned to the temperature of the several climates, in which the diseases respectively exist.

(CCCCXCII.)

A state, differing from the former only in degree and extent, occurs in cases of common diarrhœa, from substances, virtually of an acrid nature, whether in food or medicine. An excessive determination of

* Dr. Lovell, late of Bristol.

blood to the villous coat of the intestines probably takes place, usually for the purpose of expelling the offending cause. It, however, seems to continue after the cause is removed, and itself constitutes a disease, which nothing will effectually remove, but a continuance of irritation, producing evacuation from the vessels, till they are, if I may be allowed the expression, tired of receiving the superfluous blood. I have, however, seen vehement evacuations of this kind continued, by strong purges, for months and even years; and yet, after death, dissection shewed the entire villous coat of the greater part of the intestinal canal still preternaturally turgid with blood.

(CCCCXCIII.)

In cases in which there is no diarrhœa, but that state of bowels, common on the sea-coast, which sometimes begins without inflammation, and at other times follows it; and which, in both instances, often continues for many weeks; the patient will have uneasy tympanitic tension in the abdomen, with tendency to constipation, accompanied with feverishness, inappetency, and dryness of tongue; and nothing seems to afford any immediate relief, but ten or twelve daily stools. I have seen this necessity continue for five or six weeks, and even as many months, so that, if the purging were intermitted for a single day, sickness would ensue, with an aggravation of uneasiness and fulness in the abdomen, and a disposition to shivering, with subsequent increase of fever. In these cases, it signified not whether the motions

were highly bilious or not. The patient was relieved, as long as they were copious and loose; but not finally cured, till they were mucous, and more especially in some degree bloody.

(CCCCXCIV.)

From these facts it may be concluded, that the disease last mentioned consisted in excessive fulness of the mucous membrane, which was not relieved, till its vascular system was copiously evacuated. After this effect had been produced, the motions began to assume their healthy appearance, and, in all the cases, the patients recovered.

(CCCCXCV.)

Of the truth of this theory, it is, in my judgment, a decisive evidence, that I was myself cured of such a disease, on the twentieth or twenty-first day, by a great evacuation of blood from leeches applied to the loins; and that, in a boy of seven years of age, in whom there were such motions as I have described, with fever, and almost total insensibility, and who had in vain, for sixteen days, tried all the most approved aperients, six ounces of blood taken from the temporal artery on that day, and again on the next, immediately brought the stools to their natural state, and the patient to convalescence.

(CCCCXCVI.)

There is a disorder, not uncommon, but of a very dangerous kind, which probably originates, and is

chiefly seated, in the mucous membrane of the small intestines.

(CCCCXCVII.)

In its symptoms it greatly differs from the usual morbid affections of the colon. It appears under two different states, that of chronic sanguineous fulness, and that of acute inflammation; the peculiar symptoms and tendencies of both of which will be hereafter more largely considered.

(CCCCXCVIII.)

The latter constitutes that disease in infants, which has been called the Weaning Brash; though it also occurs in persons of all ages.

(CCCCXCIX.)

The former is of more rare occurrence, and is sometimes of long duration. It is then usually unaccompanied with either vomiting, sickness, tension, pain, or soreness, yellowness of the skin, or fever, and is not incompatible with a moderate appetite: and though it is occasionally attended with frequent purging of a substance like the whitest pipemaker's clay, more or less diluted with water, yet, on dissection, the liver has been found entirely free from disease, the gall bladder containing healthy bile, and all the biliary ducts perfectly open.

(D.)

It is apposite to the present occasion to advert to

that state of the circulation in the aorta, which often occurs, and in which that artery, in the abdomen, gives a sense of pulsation so violent, as sometimes to occasion an apprehension of aneurysm. In all persons who are not very fat, the pulse of the aorta can easily be felt, while they lie on the back, if strong pressure be made a little to the left of the median line, about half way between the navel and the scrobiculus cordis; and in some instances the pulsation is painfully perceived by the patient himself. In many cases of this kind, as in nervous patients, this sense of pulsation is merely the effect of preternatural action of the heart, in consequence of which the blood is impelled with excessive force. But, on other occasions, the disorder is the effect of the pressure of some hard substance on the descending aorta, producing an uneasy feeling of strong impulse on the part, determining a disproportionate quantity of blood to the head, and giving to the hand placed on the abdomen, and sometimes even to the eye, the appearance of a beating so near the surface, as to lead inexperienced observers to conclude that the aorta is morbidly dilated. This state may arise from different causes; but the most common is a collection of fæces in the colon; in which case it sometimes happens, that almost incredible discharges of stercoraceous matter, by the aid of repeated purgatives, are required, before the uneasy beating of the aorta ceases. Whether these repeated supplies of fæces themselves may not originate in some excessive determination to the mesenteric arteries, I cannot decide; but the long

continuance and copiousness of the discharge, the latter of which sometimes appears to go far beyond the quantity of food taken during the same period, seem to justify such a supposition. If this hypothesis be just, the disease originates in the excessive determination to the branches of the mesenteric arteries ; and preternatural beating of the aorta is only the third in the apparent series of morbid affections.

(DI.)

In many cases of dyspepsia, the affection of the stomach is only secondary, while the primary disorder exists in the colon ; the villous coat of which seems to be affected with morbid sensibility, unspeakable uneasiness, burning heat, and all those other circumstances, which have been described as occurring in the stomach. This state is very apt to run into inflammation, and is, I believe, a frequent origin of strictures in this intestine, in the manner which I have before endeavoured to explain.

(DII.)

The fluor albus is sometimes evidently furnished by the uterine vessels ; and at other times is a mere increased secretion from the mucous membrane of the vagina. The first state has been demonstrated, in cases of amennorhœa, by the appearance of the discharge solely at the regular periods of menstruation. What distinctions are to be relied on in all other cases, I am incompetent to suggest.

(DIII.)

The gleet from the urethra in males, whether it occurs as the prelude of gout, which is sometimes the case, or as the sequela of gonorrhœa, is doubtless owing to an excessive determination of blood to the mucous membrane of the urethra.

(DIV.)

These are the chief examples, that occur to my memory, of simple morbid determinations to mucous membranes; but since the tears are found to resemble mucus in their chemical qualities, we may here advert to that increased afflux of blood to the vessels of the conjunctiva, and the flow of tears which accompanies it, when the eye is affected by excessive heat or cold, strong light, various chemical acrids, a grain of sand, certain mental affections, and other states of excessive determination of blood to the head.

(DV.)

In many of the examples specified, and which are accompanied with discharges, those discharges are natural ones, either increased to an excessive degree, or else changed for those, which, in health, are not usually connected with the parts severally affected.

(DVI.)

On some occasions, in mucous membranes, there seems to be a certain order or gradation of discharge or secretion, proportioned, perhaps, to the degree of increased impetus in the vessels of the part, till it has

even, in some instances, passed into inflammation. Thus in a coryza, we have first a thin secretion, like serum, then a thicker mucus, and, lastly, blood. So in diarrhœa, we observe, first, serum, then mucus, then thick albumen, or perhaps fibrine; and, last of all, blood.

(DVII.)

There is a common species of deafness, of which Dr. James Sims has spoken, if not first, at least best, in an excellent memoir read before the Medical Society of London. Like many other disorders of circulation, it is usually called nervous. It, however, seems evidently to arise from obstruction in the Eustachian tube. Accordingly, when it is simply of this kind, the patient can hear well, when the tube is distended by strongly blowing, with the nose, mouth, and cheeks closely shut. He can usually, also, at all times, hear acute sounds, but not the more grave ones. In this case there is so far from being any real paralysis of the nerves, that acute, or very loud, sounds are even painful; and what demonstrates that this is a disease of increased vascular fulness, or impetus, and not of nervous insensibility, is, that I have known it, first, removed on the occurrence, in the respective examples, of hepatitis, and hemiplegia, and return as those complaints were diminished; secondly, entirely cease, in two instances, forty-eight hours before death; and, thirdly, completely cured for more than a year of the remainder of life, by an accidental hæmorrhage from the humeral artery.

This species of deafness is very commonly produced by colds in the head, in which it is evidently owing to a communication of disorder from the mouth and nose, along the membrane, which is continued into the Eustachian tube. It is probable, however, that on many occasions of deafness, the malady is not confined to this part; but it is worthy of enquiry, whether, in such cases, the effect does not originate in a similar excessive impulse of blood, acting on some other essential part of the organ of hearing.

(DVIII.)

The following are additional instances of increased determinations of blood, tending to produce secretions or excretions, whether morbid or natural.

(DIX.)

Spontaneous inordinate ptyalism may be considered as an example of excessive determination to the salivary glands. If the mere influence of the mind, as a cause, give to the effect a just claim to the appellation of nervous, this affection should, doubtless, be arranged under that head; for it is frequently the result of an excessive attention to the discharge, and is often owing to constant attempts to eject it, under the erroneous notion that it is merely excrementitious. As an increased flow of saliva uniformly follows certain irritations of the mouth and fauces, just as a flow of tears follows irritations of the eyes; it is reasonable to conclude, that the increased determination of

blood to the vessels furnishing the secretion, which is visible in the latter case, exists also in the former.

(DX.)

Diabetes will probably be admitted to be the effect of an excessive determination of blood to the emulgent or renal arteries, since the secretion of urine is preternaturally increased, and since both Dr. BAILLIE and Mr. CRUIKSHANK inform us, that they found the kidneys preternaturally vascular in persons who had died of that disease.

(DXI.)

The turgescence of the generative organs is an illustration, by a healthy process, of the determination of blood to certain parts, intended to be followed by increased secretion or excretion. In rabbits, the skin of the orifice of the vagina becomes almost black, by extreme vascularity, during the season of heat; and in rams, at the usual rutting time, not only the testicles enlarge, but the skin about the inside of the thighs becomes of a florid redness. Castration, at this period, is almost uniformly followed by inflammation and death.

(DXII.)

The periods of menstruation in many females are preceded by pains about the back and loins, accompanied by a sense of great weight. These pains, which are owing to a great degree of turgescence in the hypogastric arteries and their ramifications, usually

cease as soon as the natural discharge is fully established. This turgescence, and its gradual decrease from the sanguineous evacuation, seem to be demonstrated from the fact stated above (CCCCL.)

(DXIII.)

Similar feelings sometimes occur, in a very painful degree, to males, whose passions are long excited, without ultimate gratification.

(DXIV.)

Of the progress of sanguineous momentum carrying with it increased heat and sensation, we have a beautiful example in the common process of ephemeral fevers. In these, at the commencement, all the extremities, and the whole skin, except that of some parts of the head, are pale, cold, shrunk, and in a slight degree numbed; and the pulse in the arteries of the limbs is weak and soft. By degrees, as the action of the heart increases, the impetus of the blood is augmented, first to the head, which suffers heat and pain. Then the trunk of the body becomes more warm, and the aching, which existed in the back and loins, probably from accumulation of blood in the larger aortal branches, becomes somewhat more violent and throbbing. By degrees, as the impetus extends itself to the lower extremities, the heat and pain gradually occupy the hips, the thighs, the legs, and feet. And now, at length, a sweat breaks out, as after violent exercise, first about the head, and then progressively towards the extremities,

diminishing the excessive impetus, and, with it, the inconveniences to which it had given birth.

(DXV.)

I have often known precisely the same process occur to one part, or certain parts only, of the body, as the arm, or both legs, which have gone through regular fits of what may be properly called ague, beginning with preternatural coldness, and proceeding, through excessive heat, to termination by sweating. I have also seen an instance, in which the same process of coldness and heat in the arm was often repeated, and uniformly terminated in an eruption on the skin of that part only.

(DXVI.)

Of this progress of increased impetus, there is in many women a satisfactory exemplification in the common process of menstruation. One or two days previously to that period, they suffer a violent pain and weight in the head, accompanied with flushing and heat of the forehead and cheeks, and, occasionally, sickness. In this state, the pulsation of the carotid arteries is strong, the feet are often cold, and the general symptoms are those of slight sick head-ach. In the course of one or two days, or sometimes sooner, the head-ach becoming better, the back and loins begin to suffer an aching pain; and this is a prelude to the natural discharge, which in a few hours appears; and then, the feet having previously become warm, all the uneasy feelings soon vanish.

(DXVII.)

Nervous women often suffer a sudden determination of blood to the skin of the face, and sometimes the greater part of the body. It is accompanied with, and probably produced by, increased action of the heart, is attended with a flushing and great heat of the skin, and, in an instant, succeeded by sweating; after which the skin becomes cold, and the action of the heart is diminished, often in an undue degree. In the latter case, some faintness ensues. All the steps of the process are performed in a very rapid manner; and are called by the vulgar, in this part of England, Hot Blooms.

(DXVIII.)

It seems as if a peculiar modification of increased momentum of blood accompanied, and perhaps determined, that species of tumour, called fungus hæmatodes, which has lately occupied the attention of the medical profession. These cases are by no means rare, and are to be found in the works of several modern authors; but more especially in that written expressly on this disease by the ingenious Mr. Wardrop, and illustrated by several elegant engravings.

STRUCTURE and FUNCTIONS of the NERVOUS SYSTEM.

(DXIX.)

BEFORE we proceed to consider one of the most common and important modifications of excessive determination of blood, which is that to the Brain, it will be proper to state, in a summary way, the structure and more obvious functions of that organ, and of the other parts, which, with it, constitute the Nervous System.

(DXX.)

This system, though long an object of anxious inquiry among anatomists, has been with little success investigated, till of late, that it has received the most extensive and satisfactory illustration from the labours of those acute physiologists, the Doctors GALL and SPURZHEIM.

(DXXI.)

Under the term Nervous System are comprehended the Nerves, Ganglia and Plexuses, the Spinal Marrow, the Medulla Oblongata, the Cerebellum, and Cerebrum.

(DXXII.)

The nervous system consists of two peculiar substances. One of these, which is usually called Medullary, and which is of a white or cream colour, forms certain portions of all the different parts just enumerated. This substance, which is generally admitted to be of a fibrous structure in what are usually called nerves, is supposed, and for the most part demonstrated, to have every where a similar texture, by the scientific anatomists whom I have last quoted.

(DXXIII.)

The other substance, usually called, from its colour, Cineritious or Grey, or from its situation, relatively to the white substance in the encephalon, Cortical, is of different tints and shades of colour, as grey, blackish, pale red, &c. It is a pulpy mass, usually softer than the white, but of no assignable organic structure. It not only forms the more external part of the brain and cerebellum, but follows their convolutions, constitutes many parts of their interior structure, and is to be found in the medulla oblongata, spinal marrow, ganglia, plexuses, and even in various parts of the course of the nerves themselves. It is every where abundantly supplied with sanguiferous vessels.

(DXXIV.)

Conformably to the true mode of philosophizing, we must begin with considering those animals which are most simple as to their faculties and structure,

and thence extend our researches upwards to those which are more complicated and noble.

(DXXV.)

In the confervæ, there is no trace whatever of any alimentary canal. In the polypi, and many others, the greater part of the body is a tube, adapted for the reception of food. The substance, of which these animals are composed, is an uniform, pulpy, gelatinous, and somewhat granulated mass.

(DXXVI.)

In the classes of animals next above them, in which there is the superaddition of sanguiferous vessels, the gelatinous mass is divided into knots; from each of which arise evident nervous filaments, going to different parts of the body, to which the number of these masses or knots is proportioned.

(DXXVII.)

MM. Gall and Spurzheim consider these knots as true ganglia, each of them, with its out-springing filaments, constituting a distinct nervous system; and the several nervous systems of the viscera of these inferior animals, as the types of those which should be found in animals of higher rank, having similar parts with similar functions.

(DXXVIII.)

Such systems actually exist, and are those of the

plexuses of the thorax and abdomen, and of the ganglia of the Great Sympathetic or Intercostal nerve.

(DXXIX.)

The existence of these systems in animals, which have neither brain nor spinal marrow, clearly demonstrates that they do not originate from either of those parts; but that they are independent systems, derived from their own gelatinous masses, and each having its own peculiar functions; although, conformably to the opinion of various physiologists, and more especially Bichât, these ganglia communicate by nervous filaments with each other, with the spinal marrow, and with the brain.

(DXXX.)

In reality, in proportion to the rank which created beings are intended to hold in the scale of existence, and the additional functions which are suited to that gradation, new parts are added; which, for the purposes of minutely varied and reciprocal influence, require numerous communications between each other and the whole.

(DXXXI.)

On this principle, we can easily understand, why the system of ganglia of the great sympathetic nerve in the thorax should have its origins and functions distinct from those of that in the abdomen; and why each should have its several communications, by nervous filaments, between its own several parts, as

well as with those in the abdomen, in the spinal marrow and brain.

(DXXXII.)

Ganglia and plexuses, though they differ in size, form, and colour, are every where penetrated with blood-vessels, and contain gelatinous matter, which may be considered as being of the same nature with the cineritious or grey substance, abundantly existing in other parts of the nervous system. All swellings, containing nerves and grey substance, are ganglia.

(DXXXIII.)

As, wherever white nervous filaments exist, whether in what is called nerve, spinal marrow, medulla oblongata, cerebellum, or cerebrum, grey substance is found at their origin, MM. GALL and SPURZHEIM conclude, that these filaments are generated by it; whence they denominate it the Matrix of the nerves.

(DXXXIV.)

Conformably to this view, it will be found, that white filaments not only originate from grey substance, but, wherever they pass through or come in contact with it, receive from it additional filaments; in consequence of which their bundles increase in size; so that nerves may be considered as virtual cones, of which the apices are towards the first origins.

(DXXXV.)

The nervous mass in the vertebral canal, usually

called Spinal Marrow, is a longitudinal cord, having a furrow in the median line before and behind in man, but in other animals below and above. These furrows do not pass entirely through, but are interrupted by a layer of white substance, which serves as a commissure, or medium of communication between the lateral parts of the cord.

(DXXXVI.)

Each side may be considered as made up of a succession of continuous ganglia, consisting of grey substance, which exists within in a regularly disposed form, and from knots or swellings in which, visible throughout its whole length, in all animals, in which this part exists, arise nervous filaments. At each of these swellings the filaments emerge, above and below, or before and behind, relatively to the natural position of the animal; and equally on the internal and external face of each swelling.

(DXXXVII.)

These swellings, or ganglia, are greatest, where the nerves arising from them, conformably to the functions of the parts which they are to supply, are largest.

(DXXXVIII.)

As the ganglia, uniting by nervous bundles, constitute the continuous cords which compose the spinal marrow, so the filaments, which spring out from them, converging towards each other, penetrate

the dura mater, and unite to form the nervous bundles, which pass through the intervertebral holes. These bundles again communicate by threads with each other, with the several systems of the great sympathetic, &c. and with the brain.

(DXXXIX.)

That the spinal marrow is not derived from the brain is evident, not only from the general principles which have been above stated, but also from its having been found in a state of perfect developement in fætuses, which have been born at their full time, without cerebrum, cerebellum, or medulla oblongata.

(DXL.)

The Medulla Oblongata is that enlargement, which, in man, is immediately above the spinal mass; beginning at the lower part of the great occipital foramen, and terminating above at the transverse furrow immediately below the tuberculum annulare, or pons varolii. It is composed of white and grey substance, has various protuberances, and enlarges as it ascends.

(DXLI.)

Of these protuberances, the chief are, first, those on the anterior part, one on each side of the median line, called Corpora Pyramidalia, Eminentiæ Pyramidales, or more simply Pyramids; next, on each side, the Corpora Olivaria; and without these, still more laterally and posteriorly, the Corpora Restiformia,

Processus Cerebelli ad Medullam Oblongatam, or Crura Cerebelli.

(DXLII.)

These various swellings are more strongly marked in most brute animals than in man, while, at the same time, for a reason which will hereafter be assigned, the tuberculum annulare is comparatively small.

(DXLIII.)

The reason why in brute animals there is this superiority in the size of the medulla oblongata, is, that it bears a relation to the size of the nerves usually called Cerebral, which, at their origins, are in them more strongly developed.

(DXLIV.)

Of these nerves, the Hypoglossus, the Vocal or Vagus, the Glosso-Pharyngeus, the Acoustic or Auditory, the Facial, and the Abductor, in man, and the same nerves, together with the Trigeminus, in brutes, are directly traceable to this part, or its immediate neighbourhood.

Of those which remain, according to the authors whom I quote, the Trochlearis emerges from the Valvula Vieussenii, but appears to originate considerably lower.

The Motor Oculi springs from the Crus Cerebri, but can sometimes be traced as far as below the Tuberculum or Pons.

The Optic nerve probably arises from the anterior

Tuberculum Quadrigeminum, or Natis; and not, as is generally supposed, from the Thalamus Nervi Optici, although it passes round that part.*

The origin of the Olfactory nerve is less certain than of those which precede; although it is probably assignable to the medulla oblongata. At least, it certainly does not emerge from white substance, but from grey substance at the bottom of the hemisphere.

(DXLV.)

From these circumstances, and many others which will be obvious from due anatomical scrutiny, it appears, that the various nerves, called Cerebral, are neither produced by, nor originate in, the medullary substance of the brain; but that, on the contrary, after proceeding from their own grey substance, they ascend towards the brain, involved in some cases within it, receiving accessions of white fibres from grey substance as they pass, and afterwards detaching themselves, at a distance from their first origins, from different parts of the cerebral mass.

(DXLVI.)

Not only do these and other nerves originate in grey substance, and receive reinforcements from it

* While I was engaged on this very subject, a case, proving the truth of these positions, occurred to Mr. George Norman and myself. In a gentleman, blind for two years with cataracts, both optic nerves were found reduced to nearly half their natural size, and the anterior tubercles or nates were, in an extraordinary degree, flattened and shrunk; while both thalami retained their plumpness and other usual dimensions. June 1, 1815.

in their progress; but their ultimate expansions terminate in it, as in the retina, the rete mucosum, and other instances.

(DXLVII.)

The inferior and posterior part of the nervous mass within the cranium is called the Cerebellum, while the anterior and superior is entitled Cerebrum.

(DXLVIII.)

Each is divided into two hemispheres.

(DXLIX.)

The corpus restiforme, beginning, as already stated, on each side of the medulla oblongata, may be easily traced to the cerebellum, where it meets with a mass or ganglion of grey substance, called Corpus Dentatum, &c. From this it receives accessions of white nervous filaments, which, as it is previously a large bundle, enable it to divide into many nervous branches. One of these forms what is called the Processus Vermiformis, which, from its existence in animals which want the lateral lobes, is considered as the primitive or fundamental part of the cerebellum. These different branches are composed of two nervous layers, the filaments of one of which diverge and expand, in every direction, towards the circumference, where they terminate in grey or cortical substance; as may readily be seen from the different sections of the cerebellum.

(DL.)

Exclusively of these diverging filaments, there are others, which have, apparently, no immediate connection with the former, but spring from the exterior grey or cortical substance, and, passing in various directions, converge on each side towards the anterior surface of the cerebellum, and unite in the middle, forming a thick, white, nervous stratum. This part is the Tuberculum Annulare, or Pons Varolii. As it is the great commissure of the cerebellum, it is always in direct proportion to the size of its hemispheres; so that in a great number of quadrupeds, in which these hemispheres are very small, the lower part of the tuberculum is wanting; and the whole is wanting in birds, and certain other animals, in which the cerebellum has no lateral parts.

Besides this great commissure, there is in all animals another, which unites the lateral parts of the primitive or fundamental portion of the cerebellum; and which, on account of its supposed relation to the fourth ventricle, has the name of the Superior and Inferior Valves.

(DLI.)

At the lower part of those eminences in the medulla oblongata, called pyramids, after the arachnoid and vascular coats have been carefully removed, it is easy, on gently pressing open the longitudinal furrow, to see from two to three, or more, threads of a large size, arising on each side at the back part of the furrow, and obliquely crossing and interwoven with

each other. The whole length occupied by this structure is very short, and is proportioned to the number of the small cords; which, by their direction and size, are easily distinguishable from the minute filaments, which occur in the adjacent or inferior parts of the furrow. These nervous cords may be traced on each side from grey substance below; and after they have emerged, they gradually enlarge, as they obliquely ascend, under the name of Pyramids.

(DLII.)

These and some other nervous bundles, entering the tuberculum annulare, and interlaced with others of the cerebellum, meet with a mass of grey substance within the tuberculum; from which being reinforced, they form, at their exit, the Crura Cerebri. These crura, however, themselves, by grey substance within them, contribute to their own progressive enlargement, especially in their lower layers. These, again, on each side dip into a large ganglion, or mass of grey substance, improperly called Thalamus Nervi Optici; from whence they issue, in an increased state, in a radiated and diverging direction, so that the posterior fasciculi, expanding themselves, contribute to the structure of the Posterior Lobes of the cerebrum; while certain fasciculi, from the inferior lateral face of the crura, and the exterior edge of the thalami, go to form the Middle Lobes. All the other bundles, some immediately, and others after having passed through a part of the thalami, go through a large mass of grey substance, called Corpus

Striatum, in which many additional nervous filaments are generated. All these expand, in different manners, towards the construction of the Anterior and Middle lobes of the cerebrum.

In this manner the nervous bundles from the thalami, called, by MM. GALL and SPURZHEIM, the Great Inferior Cerebral Ganglia, and from the corpora striata, or the Great Superior Cerebral Ganglia, expand and radiate in various directions, till they reach the external borders of the great or lateral ventricles, where they make a web, from which they afterwards expand, so as to form the Convolutions.

(DLIII.)

The parts, so called, consist of white nervous substance within, and grey without, and each is doubled, like the two leaves of a folded sheet of paper, with the white substance inwards, opposed to white substance; but so loosely adhering, that either by hydrocephalus, or any other slow mechanical force, the leaves can easily be opened, always in the median line of each convolution, and spread out, so as to lie flat, with the white or medullary substance within, attached to the grey or cortical without.

(DLIV.)

Here then the same law holds good as in other parts of the nervous system, before described; the nervous filaments originating in grey substance, being increased by its aid as they advance, and having their extreme expansions covered with it.

(DLV.)

As, also, in the nerves of the senses, of the spinal marrow, of the systems of the abdomen and thorax, each system successively expands, and does not attain its final perfection and end, till it reaches its termination; so the convolutions of the brain may be considered as being the ultimate expansion of the nervous fasciculi of that part, and intended for the most important functions of the animal frame.

(DLVI.)

Besides the diverging fibres, there is, as in the cerebellum, another order, which forms a large part of the bulk of the cerebrum. These fibres are, probably, derived from the grey or cortical substance on the outside of the convolutions, and converge from all parts towards the Corpus Callosum, and numerous other commissures of the cerebrum; where they mix or unite with the layers, or fasciculi, of the opposite side, and thus produce a reciprocation of influence between the two hemispheres of this important organ.

This short abstract will serve to give as general a notion of the anatomical view of the nervous system, by MM. GALL and SPURZHEIM, as is consistent with the object of this work.*

* Those, however, who would study it in the detail which it deserves, must laboriously dissect from the very accurate plates of those authors, accompanying the first volume of their "Anatomie "et Physiologie du Système Nerveux en général, et du Cerveau en "particulier;" after having carefully perused the descriptions and reasonings in that work, and in another by the same authors, entitled "Recherches sur le Système Nerveux en général, et sur

(DLVII.)

The parts contained in the cavity of the cranium have various coverings, usually called membranes; of which the outermost is the Dura Mater.

(DLVIII.)

Next follows the Arachnoides, an extremely thin, serous membrane, which, according to BICHÂT, lines the inside of the dura mater, and is thence, for the most part, reflected back across the convolutions of the brain and cerebellum, into the sinuosities of which it does not penetrate. From thence passing inwards, according to the same author, it lines the parietes of the ventricles.

(DLIX.)

Immediately within the arachnoides is the Pia Mater, which consists of vessels, held together by cellular substance, and intended to supply the various parts of the encephalon. It therefore follows all its sinuosities, is continued into, and unites, several of its portions, and forms the Plexus Choroides and Velum Interpositum, where it is surrounded by the arachnoides ; and thus, contrary to the common opinion of anatomists, is absolutely prevented from penetrating into the ventricles.

(DLX.)

The medulla oblongata and spinal marrow, like

"celui du Cerveau en particulier;" both of which may be considered as models of profound investigation, and luminous exposition.

the brain, have three coverings ; exteriorly, the dura mater, next, the arachnoides, and lastly, a prolongation of the pia mater. Although, in a state of health, this third covering is of a pale yellowish colour, it is, nevertheless, the conductor of vessels to the nervous systems of the spine, to which its internal surface is closely tied by these vascular filaments.

(DLXI.)

A continuation of similar membrane, carrying capillaries, which are usually colourless, follows and invests the greater extent of those white fibrous cords, called nerves, from whatever part of the general system they arise. To this enveloping vascular covering, certain anatomists have given the name Neurilema.

(DLXII.)

The blood supplying the brain and its membranes is derived from the two Carotid and two Vertebral arteries.

(DLXIII.)

Of these, the right carotid arises from the arch of the aorta, usually in a common trunk with the Subclavian artery. This common trunk obtains the name of Innominata; but soon divides into two branches, the subclavian and carotid. The left carotid springs, singly, from the aorta, at a small distance from the innominata; and, at a still greater distance, arises the left subclavian.

(DLXIV.)

The carotid, on each side, ascends, in one trunk, as high as the upper part of the larynx; and then divides into two branches, the External and Internal.

(DLXV.)

The external carotid goes chiefly to the outside of the head, the face, the tongue, the throat, the neck, and the dura mater, of which last it forms the principal arteries, called Meningeal.

(DLXVI.)

The internal carotid, entering the cranium through the tortuous passage bounded by the sphenoid and pyramid of the temporal bone, and called, from its chief function, Canalis Caroticus, is principally allotted to the supply of the eye, the nose, and the anterior and middle lobes of the cerebrum.

(DLXVII.)

The vertebral artery arises on each side from the subclavian, and passing upwards through the holes in the transverse processes of the cervical vertebræ, enters the cranium by the great occipital foramen.

(DLXVIII.)

Having entered the foramen, these arteries run, one on each side of the medulla oblongata; from whence they give branches to the neurilema of the spinal nervous cord, or marrow, and to the cerebellum.

(DLXIX.)

The vertebral arteries, converging, meet together at the upper end of the medulla oblongata, and form in the center a single trunk, called the Basilar Artery; which, running strait upwards along the tuberculum annulare, divides at its upper part into several principal ramifications, which chiefly supply the posterior lobes of the cerebrum, and the cerebellum. The two foremost branches, advancing, unite respectively with the trunks of the carotids, soon after their exit from the canalis caroticus.

(DLXX.)

So also, of these trunks of the carotids themselves, the two most anterior branches unite somewhat farther forwards, in the median line between the two anterior lobes of the cerebrum.

(DLXXI.)

Thus complete communications are formed, by anastomosis, between each of the two vertebrals and two carotids, and again between the carotids and vertebrals with each other.

(DLXXII.)

This arterial circle, which is often called the Circle of Willis, is visible, with little aid from dissection, on the base of the great nervous mass, if the whole be carefully taken out of the cranium.

(DLXXIII.)

Into a minute description of the Venous Apparatus of the Brain, it is unnecessary to enter in this place. The blood, determined to that organ by the arteries, is ultimately returned from it by a peculiar set of canals, called Sinuses, included in duplicatures of the dura mater. These canals, uniting on each side into a larger one, called, from its situation, Lateral, pour the blood, through the Foramen Lacerum Posterius or Jugulare, into the Internal Jugular Vein, which takes its course down the neck, near the common trunk of the carotid, and then enters into the subclavian vein of the same side.

(DLXXIV.)

That absorbent vessels exist in the brain is certain; since blood, effused into the medullary substance, is capable of being completely removed by a natural process, so as to leave behind no trace of itself, and merely an empty hole. From the analogy of other parts of the animal frame, it is probable that this office is performed by lymphatics; although no such vessels have hitherto been shewn in that important part.

(DLXXV.)

That the brain is the material organ of all the mental faculties, scarcely, at this period of science, requires to be proved. An extravasation of blood into its medullary substance, or inflammation, will impair the mental powers; a blow on the head will take away the senses; and a tea-spoonful of blood, effused into

certain parts of the base of the cranium, will instantly and permanently destroy all the functions of life.

(DLXXVI.)

That the nerves are the media of sensation, is also certain: for if all the nerves leading to any part be cut through, or strongly compressed, the mind is rendered incapable of perceiving any injury whatever offered to that part.

(DLXXVII.)

On the other hand, as before stated, the capacity of sensation, in man, may be impaired or destroyed by certain injuries inflicted on the brain itself; and this is the case, although the nerves of the part remain uninjured throughout their whole course.

(DLXXVIII.)

A nerve, therefore, or any part which it supplies, cannot, in strict language, be termed sensible. The whole is, that the nerve has the capacity of transmitting to the brain such impressions, as excite sensation.

(DLXXIX.)

Hence it follows, that, in man, the place of sensation is the brain.

(DLXXX.)

It follows also in reasoning, and is true in fact, that our knowledge of the precise spot on which the impression is made, and to which the sensation is

referred, is a judgment of the mind, deduced from the concurrent evidence of more than one sense. Hence, young children, wanting this experience, are incapable of locating the seat of injury. Adults, also, are ignorant of the precise spot which suffers, when situated out of the reach, of sight, and touch; and, as in the case of recent amputations, refer injuries on certain nerves to those parts of them, though now separated from the body, on which long experience had shewn the impression to have been uniformly made.

(DLXXXI.)

The same dependance of connection between the mind and the organs of voluntary motion exists in the nerves: which being cut, or in a certain degree compressed, the conscious power of the mind over the muscles, which they supply, immediately ceases.

(DLXXXII.)

That, in both these cases, the brain is the organ essential to the performance of the respective functions, is certain; for, in the case of sensation, no effect of this kind is produced by any impression made on parts more distant from the brain than that in which the nerve has been divided, or compressed; while all the parts nearer to the brain retain their sensibility unimpaired. So, also, voluntary motion continues in those parts only, which are supplied by branches of nerves nearer to the brain than the spot which has been compressed, or cut.

(DLXXXIII.)

In cases in which pressure takes place from extravasation in the brain, certain muscles suffer a loss or diminution of voluntary motion; and this loss is usually on the side opposite to that on which the pressure exists.

(DLXXXIV.)

According to Dr. SPURZHEIM, this rule obtains only with regard to the anterior and middle lobes of the cerebrum, which, originating from the pyramids, subject certain parts to the effects of the decussation already described; while certain portions of the posterior lobes and the cerebellum, being derived from the more posterior parts of the medulla oblongata, are not connected with this decussation; so that pressure on them, as on the spinal marrow, produces paralysis on the same side as that on which the injury is inflicted.

(DLXXXV.)

This theory, however, does not appear to ascertain the cause of the paralysis of parts supplied by nerves which originate above the decussation, as of the face from paralysis of the trigeminus, or facial nerves, &c.; although this also occurs on the side opposite to the pressure.

(DLXXXVI.)

The loss or diminution of voluntary motion, from pressure on the nervous cerebral mass, is sometimes

accompanied with that of sensibility in the same parts. Nay, examples have occurred of the latter state without the former. The cause of this difference is altogether hidden.

(DLXXXVII.)

It is well known, that there is a species of sensibility diffused over a great part of the animal frame. This consists, chiefly, in a general consciousness of impressions, which, when violent, are painful; and exists in a very great degree in the cutis. To these effects we may give the name of General Sensation; and to the power or capacity, that of General Sensibility.

(DLXXXVIII.)

Other effects, or powers, of this nature may be denominated Specific; by which I understand that difference of sensation, or sensibility, which, exclusively of any supposed difference in the qualities of the impressing object, results from the circumstances of the part, which is the subject of the impression. We see this, not only in the different organs constituting what are called the senses, but in various other parts of the animal frame.

(DLXXXIX.)

There is, however, in the visible structure of different nerves, nothing which can explain this variety in the quality of perceptions.

(DXC.)

As we have found that the destruction of continuity of certain nerves with the brain is followed at once by the loss of the sensibility and power of voluntary motion of a part, we are led to conclude, that the same nervous bundles, in modes absolutely unknown to us, on most occasions, perform both functions. This does not preclude the possibility, that different filaments of the same bundle may be appropriated to these several offices.

(DXCI.)

It is, however, certain that some nerves, as the olfactory and optic, are concerned in the production of sensibility alone; though I recollect no indisputable instance of the converse, or the power of producing voluntary motion by nerves which do not, at the same time, impart the capacity of general sensation.

(DXCII.)

Since we find that, in organs of mixed sensibility, that is general and specific, nerves with more than one origin are distributed, we might *à priori* reasonably conclude, that a different nerve was appropriated to each of these various functions. This is, I think, proved to be the case in fact, in one instance of complex nervous distribution. Thus, while the power of voluntary motion, and of general sensation, in the tongue, is dependent on the glosso-pharyngeus and hypoglossus nerves, the capacity of the specific sensation of taste originates from the inferior maxillary

branch of the trigeminus. Hence I have seen the power of taste of half the tongue destroyed by pressure on the latter nerve without the cranium, while the capacity of voluntary motion, and of common or general sensation, remained unimpaired. So, on the contrary, I have known the power of speaking and swallowing greatly diminished, in one case, spontaneously, and in another by a fall on the head, while the senses were entire, and the taste remained perfect.

(DXCIII.)

Whether the optic and olfactory nerves, in their natural state, are nerves also of general sensation, has not, so far as I know, been proved; and I doubt whether it be true that cutting the frontal nerves, which are twigs of the first branch of the trigeminus, will directly produce blindness; though it may accidentally do so, through some indirect and circuitous process.

(DXCIV.)

It is only those parts which are supplied by nerves originating from the medulla oblongata, and medulla spinalis, which, in a state of health, possess what we call sensibility; and this arises from their connection with the mind through the brain.

(DXCV.)

On the other hand, the parts supplied by nerves which originate in the thoracic and abdominal plexuses, and from the chain of the great sympathetic

ganglia, are, in health, insensible; and it is asserted, that these nerves themselves are utterly void of all sensibility.

(DXCVI.)

If, however, certain parts supplied with nerves from these origins become inflamed, they are then said to acquire sensibility, like other parts more immediately connected with the encephalon; or in other words, become capable of transmitting to the brain those impressions which excite sensation.

(DXCVII.)

How far this assertion is true, I know not. Capsular ligaments, when inflamed, certainly become painful; but in more than one instance, in which I have seen tendons in a state of sloughing, the parts of the tendon immediately adjacent to the slough have been variously irritated and cut through, without the production of any pain, or other sensation whatever.

(DXCVIII.)

It must, however, be admitted, that all parts have peculiar functions, which are justly attributable to the different modifications of susceptibility, derived from the specific powers or capacities of the nerves, with which they are supplied. Thus, as the retina conveys to the brain those impressions which produce sight, and the nerves of the nose those which produce smell, so those of the stomach give the sensation of hunger, &c. &c.: and the nerves of no one part have any

specific sensibility in common with those of any other part.

(DXCIX.)

The phænomena of voluntary motion, and of sensation, such as I have described it, as being connected with the brain, are called by Bichât Functions of Animal Life.

(DC.)

Exclusively, however, of voluntary motion, certain parts have powers of motion, without volition ; which being supposed to be altogether independent of the brain, have been stiled Functions of Organic Life.

(DCI.)

Of these, one species has been called Automatic or Involuntary ; and as arising from certain causes denominated Stimuli, has been named Irritability.

(DCII.)

It exists in muscular fibres, but is not peculiar to them.

(DCIII.)

It exists in animals which have brains or other nervous systems, on which, however, it does not necessarily depend ; for it is to be found in polypi, and other animals, that have no nervous systems.

(DCIV.)

Even the heart itself is found to have no nerves,

except those which accompany its blood-vessels; and yet, though altogether out of the influence of the will, it readily contracts on the application of a great variety of irritating substances.*

(DCV.)

It is, also, greatly influenced by causes which act on the mind, and its medium, the brain. In proof of this assertion, we may advert to the effects of anger, fear, suspense, hope, joy, pain, and various other mental affections. So, also, it is acted on by various states of disease, in parts which are void of sensibility.

(DCVI.)

This subject naturally leads to the consideration of Sympathies and Instincts.

(DCVII.)

When, from a cause immediately acting on one part, so as to produce sensation or motion, either or both of these effects is produced on another part, that second effect is called sympathy. Thus, in inflammation of the liver, a pain is sometimes felt on the top of the right shoulder.

* The assertion of the want of nerves in the muscular substance of the heart is erroneous. Although, in man, the nerves, at their first entrance, accompany the arteries, the small branches finally leave them, and plunge among the muscular fibres, as in the muscles of voluntary motion. See Scarpa. Tabulæ Neurologicæ v. and vi. in man; and in the horse and calf, vii.; also Proëmium § vi. § vii. § viii. § ix. § xxxi.

(DCVIII.)

Some physiologists have attributed these effects to the communications of the branches of different nerves. Of this supposed reciprocation of influence, numerous examples are given by SOEMMERRING.

(DCIX.)

Others, on the contrary, attribute sympathies to the intervention of the brain. Of this number was, especially, the late Dr. WHYTT, of Edinburgh.

(DCX.)

That the communication by nerves is unnecessary to motion connected with sensation, is evident in the case of the iris; which does not move by any known stimulus applied to its own fibres, but suffers elongation by the influence of light, and I believe light only, on the retina, with which it has no nervous communication.

(DCXI.)

On the other hand, that the intervention of the brain is not necessary to the association of certain muscular movements from slight irritation on a distant part, such as usually produces sensation, is evident from the case of a fœtus, in which there was not the smallest vestige of a cerebrum or cerebellum, but which, even twenty hours after birth, moved up its knees when the soles of its feet were tickled, sucked my finger, when introduced into its mouth, and, a few hours before, had passed fæces and urine, and

swallowed food. It is true, that, in this case, there were a spinal marrow and medulla oblongata ; but the same motions are recorded as having occurred in another example, in which both these parts, as well as the brain, were totally wanting. From the great resemblance, in other respects, in all the cases of this kind, there is no reason to doubt, that the relation of this fact was strictly true.

(DCXII.)

In the first of these cases, then, there is sympathy without communication of nerves ; and, in the second, sympathy without the intervention of brain.

(DCXIII.)

Of sympathies we may conceive the four following different modifications :

1st, Sensation producing sensation.
2dly, Sensation producing motion.
3dly, Motion producing motion.
4thly, Motion producing sensation.

To which may be added the two compound effects of the two primary affections.

(DCXIV.)

The inquiry how far, and in what cases, these different series exist, though curious in itself, does not appear to me to bear on the subject of this work.

(DCXV.)

It may, nevertheless, be remarked, that, in some

cases, sympathies arise from the mere propagation of irritation downwards along the affected nerve, as in the little finger from a blow on the nerve in the elbow. This is the cause of the pain in the outward part of the knee and ankle from sciatica, and probably, of that uneasiness called aura epileptica.

(DCXVI.)

There is, however, one important origin of sympathy, with regard both to motion and sensations, which has been too much overlooked ; and that is, a co-existence of vascular affections, often arising from a common determination of blood to vessels of several parts derived from one common trunk. Thus, an increased determination to the internal iliac arteries may affect, at the same time, the different branches of that artery, which supply the uterus, the bladder, and the rectum. Since, also, the heart itself, as I have before observed, is found to have no nerves, but those which accompany its arteries, it is by no means impossible, that various causes, acting on it through the mind and brain, may produce their effects by a nervous influence on the extreme arteries of the part.

(DCXVII.)

Even where sympathies may be suspected to originate in other causes, there is reason to believe, that they often ultimately consist in some vascular fulness of the sympathizing part ; for, in inflammation of the liver, the top of the shoulder, and in renal calculus, the forepart of the middle of the thigh, to

which parts pain in these respective maladies is referred, are actually both sore to the touch.

(DCXVIII.)

It is, indeed, certain, that all the associated movements of the constitution, in which the circulating system is concerned, and which constitute a large majority of the affections, whether of health or disease, are examples of this kind of sympathy.

(DCXIX.)

Although, however, certain examples of sympathy may be connected with visible circumstances of structure, or may depend on principles, which are evidently common to many other series of phænomena in the animal frame, it is probable, that no assignable cause of this kind is essential to the production of all these effects.

(DCXX.)

The first movements of the animal are evidently automatic and instinctive. A lamb will stand up, and that with little difficulty, in a few minutes after it has been yeaned. Immediately, also, it begins to suck. What experience had it of the mode in which these effects were to be accomplished? But it has been said, that it learned them in the womb. Did it learn, also, to breathe in the womb? That operation it performs, the instant it comes into the air, as well as at any subsequent period of its life. Who told the skylark, hatched by a sparrow, to fly to the ground, imme-

diately on leaving its nest; and the sparrow, hatched by a lark on its first flight, to attempt perching on a tree? What was the process of reasoning in the brainless fœtus, which sucked the finger, and had previously swallowed food?

(DCXXI.)

These are all automatic and instinctive actions, taught by the immediate and all-pervading mind of the Deity, and not more extraordinary, or in reality more automatic, than the choice, which, in order to obtain a particular end, we instantly make of certain muscles, of which we know neither the name, the situation, nor the power. From past experience we see a desirable purpose to be attained, and no interruption to its attainment; and immediately certain muscles, calculated to attain that end, act, and the purpose in view, if practicable, is effected. In this act, every part of the process seems to flow from that which precedes it, exactly in the same way as automatic motions; except that, in the former case, there is one intermediate step, the consciousness of a valuable purpose to be answered, and a belief that it is attainable, which is wanting in the latter. This is all that I know as to volition, so far as it respects motion; and, therefore, I use the term as merely expressive of a process, or series of phænomena, rather than of a distinct and independent power.

(DCXXII.)

As the cause, which produces instinctive and

automatic motions, is the immediate will of God, so I can see no other mode of explaining many of those sympathies, which take place in the animal frame.

(DCXXIII.)

In new-born infants, the faculty of sensation, which is the origin of all the mental powers, seems to exist in a very imperfect degree. Simple or general sensibility, it is true, they have with sufficient acuteness; so that impressions on the skin are keenly felt, and are often immediately followed by cries of distress. An infant, also, hears, and appears to be uncomfortably affected by loud sounds. It has some capacity of distinguishing tastes, and probably smells. It may, however, be doubted, whether, for several days, it is able to see. Accordingly, the optic nerves are extremely small, while the olfactory are, comparatively, very large.

(DCXXIV.)

In reality, the entire brain of a newly-born child seems to be a very pulpy mass, exhibiting scarcely any distinction, either as to colour, or other appearances, between the cortical and medullary substance; and in which the organization, necessary for rendering the brain the proper medium of the mental functions, is not yet established.

(DCXXV.)

This, then, is the period of simple automatic

motion, utterly devoid of that power of reminiscence, for which the infant had enjoyed no previous materials, and therefore wanting all the consequences of a comparison between the nature and order of perceptions.

(DCXXVI.)

By degrees, however, the brain becomes fit for being the organ of reminiscence, and all the dependent mental powers. Hence arises recollection, which extends not only to the quality of sensations, but to their succession; producing conclusions of good to be obtained, or evil to be shunned, by certain muscular movements. Thus, what is called Voluntary motion supersedes, in many cases, that which was before merely automatic or instinctive.

(DCXXVII.)

Still, however, as hath been before observed, even the slightest knowledge of the instruments of effecting these ends is absolutely wanting. Neither would the most accurate be in any degree conducive to their perfect use; for it will be acknowledged, that a professor of anatomy, however well acquainted with the muscles employed in dancing or fencing, is not thereby enabled to acquire or practise those arts one jot the better for his knowledge: Nay, it is evident that his knowledge is so far from directing the use of these muscles, that the former is actually derived from the latter, and must, therefore, be subsequent to it.

(DCXXVIII.)

As, however, the use of muscles is originally automatic, depending on certain stimuli, or motives, of which, in process of time, consciousness, or the existence of mental affections, becomes one; so, in farther course, the same motions, which, from an external cause, never occurred but with this intermediate stimulus, come at length to be performed with little, or perhaps no, consciousness at all, and thus are again simply automatic. Thus, we see, that while, in the commencement of any art, a particular attention to all the steps of the different processes is essential in order to produce the effect, which, therefore, is obtained imperfectly, and always slowly, a certain habitual repetition will render all these motions so easy, that nothing seems requisite, but to attend to the first link of the chain of movements, and then all the rest follow automatically and unconsciously.

(DCXXIX.)

It seems, indeed, as if certain motions, which were originally purely automatic, are only occasionally performed through the process of volition; while, on other occasions, the automatic power alone operates. Thus we continue to breathe, while we are asleep, or in a fit of apoplexy; and in both states we swallow, without consciousness, just like the acephalous fœtus.

(DCXXX.)

Many other instances might be adduced of what may be called mechanical actions, which either began

in consciousness, or, at least, came to require that consciousness as one link in the chain of phenomena.

(DCXXXI.)

Muscles, over which the mind acquires this regulating power, are still liable to automatic or involuntary motions from certain stimuli, whether external or internal. Thus, they are subject to catchings and contractions, which no power of mind can counteract, from a preternatural momentum of blood in their vessels, and from certain irritations, applied either to the nerves supplying them, or to the brain itself.

(DCXXXII.)

It is, also, worthy of attention, that, though a muscle loses all sensation, and power of voluntary motion, by cutting the nerve supplying it, its irritability, or capacity of contraction, from other stimuli, will for some time continue; and it will contract from an irritation of the nerve itself, beyond the wounded part, relatively to the brain.

(DCXXXIII.)

While on the subject of the arteries, I adduced tonicity as one power inherent in them, in common with muscular fibres. This power, in muscles, consists in a mean degree of contraction, by which the position of certain parts is so balanced, that the whole appears in a state of relaxation, or easy and equal capacity of suffering voluntary motion. That this state is derived from the brain, appears from the

well-known fact, that, in cases of hemiplegia, one side of the face, and sometimes with it the lower eyelid, will droop, while certain parts of the other side, wanting the natural antagonizing tonic power, will be contracted in an unusual degree.

(DCXXXIV.)

In this case we can hardly conceive the effect to depend on any loss of voluntary action in the paralyzed muscles; since we have at no period of our lives, during health, any consciousness, that, in order to produce the contraction, we exert any volition whatever.

(DCXXXV.)

These three states of muscular action or contraction, the Voluntary, or "Contractilité animale" of Bichât, the Automatic or Involuntary, the Irritability of Haller, the "Contractilité organique "sensible" of Bichât, and the Tonicity, seem to constitute the great powers of motion in the living animal system.

(DCXXXVI.)

I have already mentioned the power which arteries have of contracting themselves, so as to conform to the quantity of blood which they contain, and, when empty, to become, at length, impervious cords; and I have inferred, that, as this change occurs only during life, it should be considered as one modification of tonicity.

(DCXXXVII.)

That conclusion will derive farther evidence from what is often observable in paralytic arms, in which the flexor muscles overcome the action of the extensors, and keep the arm strongly and permanently bent; in which case the flexors come at last to be rigidly contracted, so as eventually to be no longer capable of elongation. From this and other circumstances, which never exist in the dead animal, I conclude that the "contractilité par defaut d' extension" of BICHÂT is the effect of a living power, and, probably, a mere excess of the natural tonicity of the part.

(DCXXXVIII.)

Hence there seems to be no just ground for considering this contractility as a separate and distinct power.

MENTAL FACULTIES.

(DXXXIX.)

IT is now generally agreed, that all our ideas are derived from sensations; and it is certain, that these ideas are the materials on which the Mind acts, or by which it is affected, in the exercise of all its faculties.

(DCXL.)

The more perfect, therefore, the capacity of sensation, in all its modifications, the more complete will be the access of these materials to the mind.

(DCXLI.)

So, also, the more numerous the actual sensations, the greater, *cæteris paribus*, will be the stock of materials on which the mind can act.

(DCXLII.)

In order that the several sensations should serve as the proper materials for the due exertion of the mental faculties, there should be a certain balance between their force; which balance appears to exist

in man in a greater degree than in other animals, and is one cause of the superiority of his rational powers.

(DCXLIII.)

The perfection of the capacity of sensation does not, however, consist in a very extraordinary degree of acuteness, but in a sort of mean degree; for we find, that, under the condition of extreme sensibility, impressions, instead of producing clear and distinct perceptions, confound the mind, and therefore lead to errors in thought and conduct.

(DCXLIV.)

This result is similar to what occurs from violent impressions on sensitive organs of a mean degree of susceptibility. Of such impressions the mind cannot estimate the qualities. Thus the eye is dazzled by an extremely strong light, the sense of hearing confused by very loud sounds, the sense of touch impaired by strong pressure, &c. In these cases, specific sensation enters within the limits of general sensation.

(DCXLV.)

On these principles, it is easy to see how necessary to the right use of the mental faculties it is, that sensations, and consequently ideas, should be numerously received through the different channels graciously given us by the divine Author of our nature; for it matters little whether wisdom be shut out at any particular entrance by the absolute want of one sense, or by the total disuse of it.

(DCXLVI.)

In reality, if we could suppose a man so constituted, as, with all the external organs of sense perfect, to have only one sense, and that sense in the natural degree, we should have no hesitation in deciding that man to be an Idiot.

(DCXLVII.)

The consequence would not be different, if any man, having his senses perfect, were to receive perceptions through one sense only.

(DCXLVIII.)

An excessive acuteness of one sense, while the others remained in the natural degree, would lead to such a preponderance of the trains of thought and actions connected with the objects of that sense, as would constitute Insanity.

(DCXLIX.)

The indulgence of any preponderating train of thought, connected with some important object, so as not to exclude those trains, which lead to other necessary knowledge or conduct, implies a degree of wisdom suited to the state and imperfect capacity of man.

(DCL.)

If, however, even in such a pursuit, we admit of only certain trains of perception or thought, and voluntarily shut our eyes against other perceptions which

are connected with it, merely because they may interfere with our prepossessions and prejudices, we are then doing our utmost to approach to the idiotism of that man, who is born with one sense only.

(DCLI.)

Although, however, sensations, and thence the ideas which grow out of them, are the materials from which we think, judge, and act, it is evident that they would little avail us, were there not superadded that capacity of employing them, which constitutes the faculties, by the degree or nature of which man is chiefly distinguished from other animals.

(DCLII.)

Even in man himself there is great difference in these respects. For while one imbibes ideas quickly, these as quickly give place to the new stream which follows. Another, on the contrary, receives them more slowly, but with difficulty again loses them. The man of great memory, however, is rarely at the same time blest with the capacity of quickly and justly combining the ideas with which his mind is stored.

(DCLIII.)

We see this difference in the mental faculties almost in infancy; and are able to observe, that it consists, not only in the acuteness of perception, or the capacity of reminiscence, but in the power of accurately separating and arranging ideas.

(DCLIV.)

These processes of mind are peculiarly connected with the different periods of life; and, were it consistent with the plan of this work, it would be easy to shew the order in which the several faculties or affections of the mind unfold themselves with advancing age.

(DCLV.)

One faculty, which is particularly observable in early life, is that of a rapid juxta-position of ideas by slight and unessential resemblances; while at a later period, all fanciful approximations are carefully shunned, and ideas are brought together by their precise and important analogies only. Hence wit is the peculiar attribute of childhood, and judgment the faculty of mature age.

(DCLVI.)

Whether an early capacity, constituting what is called Genius, disposes persons to excellence in one pursuit more than in others, seems to be a question within the province of morals or metaphysics, rather than of medicine.

(DCLVII.)

The subject, however, of the connection between the powers and propensities of the mind, and the circumstances of bodily form and tendency to disease, as comprehended under the science of Temperaments, has been thought worthy of occupying the attention

of medical philosophers from the time of HIPPOCRATES to the present day. Those, who would see to what fanciful lengths speculative principles may be carried by ingenious men, may consult on this subject CABANIS.*

(DCLVIII.)

Of late, the physiologists whom I have before quoted, MM. GALL and SPURZHEIM, have viewed the subject in another light; and have endeavoured to shew, that the capacity for the respective arts and sciences, as well as the sentiments, moral tendencies, and other intellectual faculties, are connected with the comparative proportions of certain parts of the convolutions of the brain, and indicated by the proportions of corresponding parts of the cranium.

(DCLIX.)

These conclusions, which are illustrated by those physiologists with great force of demonstration, have not hitherto received the sanction of general experience. But to deride them solely on that account would be highly absurd; since we are justified in concluding, that, as it has pleased Providence to make an organized material substance the medium of all the mental faculties, these several faculties may depend, for their existence, on certain parts of the organized mass, and for their degree, on the proportion of those parts.

* Rapports du Physique et du Morale de l'Homme. p. 45.

(DCLX.)

We find that the brain, and through it the mind, is stimulated to the exercise of its affections, and the performance of all its functions, not only by direct sensations, but by ideas, and those arrangements of them which are concerned in the processes of memory and judgment.

(DCLXI.)

These several affections, in their turn, act on the brain and nervous system; and, through one or other of them, on some part, or the whole, of the blood-vessels. Of this influence, some examples have already been pointed out; but it will be proper again to adduce them, with some additions, in this place.

(DCLXII.)

Mental affections are cognizable by the bodily feelings and movements which accompany them, and by the trains of thought or action, to which they give birth. This subject, important in a metaphysical view, does not require to be farther prosecuted here.

(DCLXIII.)

It has, however, been mentioned in general terms, and very interesting facts may be brought to prove the truth of the assertion, that various mental emotions, such as surprise, suspense, and vexation, will produce, or renew, some inflammatory affections, such as gout and acute rheumatism, both through increased action of the heart. So, through the same medium,

anger will flush the face, and produce hæmorrhage from the nose. Courage, confidence, and determination to accomplish certain ends, will sustain the action of the heart, and prevent that syncope, which would otherwise arise from considerable hæmorrhages.

(DCLXIV.)

On the contrary, in a patient labouring under severe symptoms of incipient fever, shewing itself in extreme heat of the skin of the head and neck, a very quick and full pulse, and a violent head-ach, I have seen all the symptoms nearly removed in a few seconds by the mere operation of fear.

(DCLXV.)

I have related above (LXIV.) some instances, from such causes, of increased natural determinations of blood to parts, without amounting to inflammation, or even entering within the limits of disease.

(DCLXVI.)

Another set of effects, from similar mental causes, are increased natural secretions or excretions; which, therefore, imply an excessive momentum of blood in the capillaries of the affected parts.

Thus, certain ideas respecting tastes, and the recollection or belief of having taken an emetic, or some other substance which the mind abhors, will fill the mouth with a preternatural quantity of saliva.

Joy, sorrow, admiration, &c. will produce a flow of tears.

Parental affection, even in certain brute animals, will, according to very common experience, occasion a copious secretion of milk; while the proximity and dislike of a strange milker will cause the milk, as the phrase is, not to come down. In the human race, I have known a Lady, who had long ceased to nurse, in whose breasts a copious secretion of milk was produced by hearing any child cry.

Various mental affections occasion sweating; and in one patient, the mere recollection of ham, cheese, and certain other kinds of food, which he much liked, but which disagreed with his stomach, immediately produced about his head a degree of sweating, which could be compared to nothing but his having dipped his whole head in water.

Great surprise will often bring on a violent vomiting of bile.

The same cause frequently occasions diarrhæa.

An increased secretion of urine is a common effect of fear and other mental emotions, in man, and other animals.

Muci, è membranâ genitalium utriusque sexûs propriâ, secretionem copiosam gignit libido.

(DCLXVII.)

As emotions of the mind, acting through the brain, produce these and many other effects on different parts of the sanguiferous system, so that system itself reacts, in a most conspicuous manner, on the brain.

(DCLXVIII.)

In reality, that which most obviously gives the brain the capacity of being operated upon by impressions conveyed through the nerves, and of serving as the medium of thought, is the impulse of blood circulating in its vessels. Accordingly, we find, that when, in consequence of defective action of the heart, of mechanical obstruction to the free evacuation of its blood, or a copious abstraction of blood from the whole system, the afflux of blood to the brain is, in a certain degree, diminished; a loss of sense, thought, and voluntary motion, constituting what is called syncope, supervenes; or, if the same causes go to a greater extent, immediate death.

(DCLXIX.)

How this abstraction of sanguineous impulse acts, we cannot presume to say; but, certainly, neither pressure on the brain, nor any other cause, has a similar operation on that organ, and through it on the immediate powers of life.

(DCLXX.)

It appears therefore that a certain determination of the blood to the brain is absolutely necessary for the support and continuance of all its functions.

(DCLXXI.)

Hence we might, *à priori*, conclude, that if these functions are diminished, on one hand, by a diminution of afflux, momentum, or determination; they would

be, within certain limits, increased by an increase of that momentum.

(DCLXXII.)

This is the case in fact; for inflammation of certain parts of that organ, or of the coverings which serve to convey blood to it, evidently, for a certain time, increases the acuteness of sensation and the rapidity of thought.

(DCLXXIII.)

So, also, in other febrile diseases, in which there is long increased action of the heart, and pain of the head, all the perceptions often become preternaturally acute. The patient hears the sound of the approaching carriage, or of the distant nightingale; while to those who surround him, every thing is clothed in darkness and silence: ideas pass through the mind with such velocity, that the apparent period of a month is comprised within the limits of a day; and the patient is conscious of a corresponding rapidity of utterance, which he feels himself with difficulty able to controul.

(DCLXXIV.)

About the same period of increased impetus of blood in the brain, sleep is almost wholly wanting; or if, after some long interval, the patient for a moment forgets the surrounding objects, horrid images present themselves to his sense of seeing, so exactly mocking realities, that he starts out of his

sleep violently agitated, and for a while hardly believes that he was in a dream.

(DCLXXV.)

If, now, the cause, producing these effects, continues, the next step is actual waking delirium, with its different phænomena.

(DCLXXVI.)

Whether, in all cases of febrile delirium, there is, conformably to the sentiments of a late ingenious writer, actual inflammation of the brain, or its coverings, experience has not enabled me to decide. Neither, perhaps, even in a practical view, is the question of essential importance, if the circumstance of excessive momentum be common to other states of the brain with that of inflammation; and if such a condition actually exist in these maladies.

THE NERVOUS CONSTITUTION.

(DCLXXVII.)

THERE is no class of diseases, to which persons of a certain rank are more liable, than those, which have been usually denominated Nervous.

(DCLXXVIII.)

This term has been applied to all inordinate movements of the parts concerned in the functions whether of animal or organic life; and to nearly all morbid states of sensation, and their consequences, which cannot be traced either to inflammation or mechanical injury.

(DCLXXIX.)

The Nervous Constitution or Temperament shews itself by an extraordinary degree of sensibility and irritability; so that certain impressions, which, in a well-adjusted constitution, are either indifferent or pleasurable, produce pain, inordinate actions, or both.

(DCLXXX.)

It is especially apt to affect persons, who, from the constant habit of self-indulgence, from the vicious compliance of parents, from the indolence and luxury too often attendant on wealth, and from certain sedentary or recluse occupations, are exempted from those irritations and pains of body and mind, which Providence has made essential to our well-being in this probationary state.

(DCLXXXI.)

Very striking examples of the influence of these causes might easily be adduced; and it is a fact not less curious than true, that the same causes produce nearly the same effects on various animals dependent on man.

(DCLXXXII.)

Now, as all simple or uncomplicated sensations become less acute from being frequently excited, we might, from what has been before observed as to the place or seat of sensation, readily conceive, that the causes, which predispose to the nervous temperament, act immediately on the brain itself, as the ultimate organ of sensibility, and the chief medium of the greater number of animal motions.

(DCLXXXIII.)

It is true, that among the parts, which become thus inordinately irritable, in the nervous constitution, are, often, those of organic life; as, the alimentary

canal, and, more especially, the heart, and other portions of the vascular system. But, even here we find, that the influence of certain mental impressions, acting through the brain on these various parts, is greatly lessened by the mere repetition of the irritation; so that a boy who starts with terror at the report of a gun, will, after having been a few weeks in the naval service, himself fire a cannon without the smallest trepidation.

(DCLXXXIV.)

From these phænomena we cannot avoid inferring, that, in different persons, and under different circumstances, there is an immediate variety in the brain itself, which may tend, in various respects, to regulate, modify, or produce the original or acquired capacity, and dispositions, of the individual being, who is the object of examination.

(DCLXXXV.)

Still, however, this state can be considered as merely affording a disposition to be easily acted upon by the various causes of excitement, to which the subject of it is exposed.

(DCLXXXVI.)

It becomes, also, an important question, in point of fact, whether this state of morbid excitability, from long exemption from the causes of excitement, would reach that extent of disease, and therefore of influence

on other parts of the constitution, which we see in the nervous temperament, without the co-operation of some other cause. This question may be exemplified by that disease of the brain, epilepsy; as it includes all the various phænomena, which accompany the course of its paroxysms.

(DCLXXXVII.)

From the facts and considerations, which are about to follow, I think it will appear, that such a concurrent cause does actually exist; and that this cause is excessive impetus of the blood, acting on the medullary substance of the brain, or some other part of the encephalon.

(DCLXXXVIII.)

So far, therefore, as respects even an early view of morbid excitement, we shall readily acknowledge, that its actual degree will be in the compound ratio of the predisposition, and the force, of the exciting cause; a slight exciting cause being sufficient, where there is a great predisposition, and vice versa.

(DCLXXXIX.)

In reality, an exciting cause itself, on various occasions, seems to increase predisposition. Thus, phlegmonic inflammation, producing pain, renders the part more subject to the perception of pain from a given degree of external impulse, than if such inflammation did not exist.

(DCXC.)

In the same manner we may, *à priori*, conceive, and facts will be hereafter adduced, which, I trust, will prove, that increased impetus of blood not only excites actual disorder, but disposes the brain to be more easily acted on by other causes of irritation, than if that excessive impetus did not exist.

(DCXCI.)

In this effect there is, indeed, nothing extraordinary; inasmuch as the predisposition in the brain itself, the increased impetus of blood, and any other coincident irritation, are only so many causes concurring to the production of certain common effects, just as every weight, of whatever form or force, which we put into a scale, tends to increase the preponderance of that scale.

(DCXCII.)

Since, also, excessive determination of blood to the brain does not, for the most part, produce its morbid effects, until after it has continued for some time; it may be presumed, that this impetus itself is capable of aggravating, or causing, that very inherent state of the brain, which we have stated as forming the original predisposition to excessive excitability.

(DCXCIII.)

If this be true, we may, perhaps, profitably carry our investigation one step farther, and inquire, whether the whole of this predisposition may not, in all cases,

be formed through the medium of the sanguiferous system; so that the exemption from impressions, &c. which I have above stated (DCLXXX.) as a cause of such diseases, may itself produce its primary influence on that system, while the brain may suffer only secondarily, but, in its turn, react on the sanguiferous system. Thus, for the sake of illustration, let us suppose, that, from indolence and other causes, the heart has acquired an excessive morbid irritability. In this case, any impression, communicated to it from the brain, may excite in it inordinate action, which, determining the blood with excessive violence to the brain, may cause it to react on various other parts, and thus produce the phænomena of nervous diseases.

(DCXCIV.)

So, also, an habitual increased impetus, not going to the extent of producing actual disease, may be the predisposing cause of that readiness of the brain to be easily affected by other irritations, whether bodily or mental, which we observe in the nervous temperament.

(DCXCV.)

Thus, in every view which we take of this subject, we see how important a part the sanguiferous system acts in the production of what are called Nervous diseases.

(DCXCVI.)

Such a conclusion would, indeed, readily follow from the fact before stated, that all the functions of

the brain, as the organ of sensation, thought, and motion, immediately cease, when the impulse of the blood on that organ is greatly diminished; and return, in proportion as the impetus is restored.

(DCXCVII.)

Having thus endeavoured to establish certain general principles respecting the circumstances, which are essential to the existence of the different functions of the brain, and which modify their degree, we are prepared to consider such diseases as will probably be found to consist in a disordered state of those functions.

(DCXCVIII.)

If, also, from the phænomena of those diseases, it shall appear, that they originate in any specific, but common, morbid affection of the brain, the physiological conclusion already deduced, as to the condition necessary for its healthy functions, may, thereby, be, in its turn, strengthened and established.

(DCXCIX.)

That nearly all the modifications of the disorders, usually called Nervous, originate in excessive momentum of blood in the vessels of the brain, I long ago attempted to prove, in an Essay sent to the Medical Society of London, and published in their Memoirs in the year 1788. In that essay was first fully detailed the fact, that by intercepting the flow of blood to the brain, by compression of the carotid arteries, excessive

sensibility with regard to external impressions, headach, vertigo, spasmodic dyspnœa, hiccup, general convulsions, and delirium, might be for a while wholly removed, or greatly mitigated.*

(DCC.)

This conclusion has derived irresistible force from the numerous facts, which have occurred to me subsequently to the first discovery.

(DCCI.)

Not only do the carotids give to the finger a sense of greater resistance during the pulse, in persons of nervous constitutions, than in others of the same sex, size, obesity, and general formation ; but the fulness and hardness of the pulse in those arteries is greater in the same person during the nervous state, than at other periods.

(DCCI.*)

In these disorders, also, the head is usually much hotter than in a state of health, and the face is often preternaturally red.

(DCCII.)

The following are the chief maladies, which, from these and other circumstances, appear to arise from excessive momentum of blood in the vessels of the brain.

* Memoirs of the Medical Society of London, vol. iii. p. 77.

(DCCIII.)

There is a state, in which, without any bodily uneasiness, ideas pass quickly through the mind, and compel a degree of attention, absolutely inconsistent with nocturnal sleep. This state is apt to be brought on by excessive bodily or mental exertion, by anxiety, by late hours, hot rooms, and by spectacles which combine the two latter causes with long continued attention, much sitting in a confined place, and a frequent succession of objects, which dazzle the eyes. It is usually accompanied with increased action of the heart; the feet are often cold, and the pulse in the carotid arteries is preternaturally strong. Under these circumstances, sleep has been, on numerous occasions, induced by lying on one side, and making with the thumb a firm compression on one carotid artery.

(DCCIV.)

A frequent concomitant of the former state, but often occurring during the day, is a complaint which is often extremely distressing, and very difficult of relief: this is, a Noise in the head or ears, of different kinds and degrees. Its more usual quality is that of a rushing sound, in one or both ears, which persons compare to that of wind, or the tide; the former of which it often resembles, by having gradually increasing and decreasing gusts, and the latter, by consisting of alternate waves. It generally increases towards night, and often is perceived only on lying down. On some occasions, it is said to resemble

music, and more particularly the ringing of bells; and I have heard it compared to the squeaking of rats or mice, and to the sound of human voices.

(DCCV.)

These noises often occur in the same patient, with various other disorders termed nervous. They not only sometimes overpower the accurate perception of other sounds, but accompany the commencement of occasional or permanent deafness, such as has already been said to arise from preternatural fulness of blood in the membranous or other parts of the organ of hearing. Hence, in common with the latter disease, they are often a mere temporary effect of cold in the head. If, therefore, the theory of that species of deafness, and of other disorders, of which these noises in the ears make a part, several of which will hereafter be mentioned, be well founded; these circumstances might be considered as sufficient to prove, that such noises depend on the rush of arterial blood through some part of the vascular system of the ear.

(DCCVI.)

This conclusion will, however, derive additional force from the following circumstances, which shew the relation of the malady in question to other excessive determinations of blood to the head. These noises are apt to be produced by whatever increases the action of the heart, as hot rooms, late hours, long watching, strong drink, violent muscular exertion, long or excessive mental attention, and whatever

agitates the mind; and they are diminished by all those causes, which have been already stated as having a contrary operation, such as, cool air, temperate living, adequate rest, and every thing which quiets the action of the heart.

(DCCVII.)

When the rushing sound is waving or alternate, as it usually is, each rush is exactly synchronous with a systole of the heart; and lastly, when the disorder has been more or less constant, and has affected one ear only, I have often been able, *pro tempore*, entirely to remove it, and always to alleviate it, by compressing the carotid artery on that side.

(DCCVIII.)

Many persons, though free from pain or mental anxiety, are apt to have their sleep disturbed by Dreaming; and as this malady occurs especially to those persons, who are subject to the two former modifications, as well as to those who are labouring under that affection of the brain before mentioned as accompanying fever, we have no reason to doubt, that, in these cases, dreaming is owing to the same local cause.

(DCCIX.)

Headach, whether affecting the external or internal part of the head, is owing to corresponding conditions of circulation in the external or internal carotid artery.

(DCCX.)

That which occurs from dyspepsia, or disordered peristaltic action of the alimentary canal, is, usually, of the first kind. It often extends itself to the muscles of the neck, and is accompanied with flushing of the face, and a strong pulsation in the carotid arteries, and their branches the facial and temporal arteries; and it may be generally relieved by strong pressure on the first of these, in consequence of which the peristaltic movement of the alimentary canal is often increased, the heat of the head is diminished, and the feet, if previously cold, become more warm.

(DCCXI.)

Of headach arising from excessive determination of blood to the branches of the internal carotid, I would here particularly specify that which is usually called the Sick Headach, so well described by Dr. FOTHERGILL.

(DCCXII.)

This malady is generally conceived to originate from some derangement of the functions either of the liver, or of the alimentary canal. The state of the stomach is, however, the effect and not the cause of the malady of the head, which it never precedes; just as sickness and vomiting are the consequences, and not the cause, of the affection of the head produced by a blow on the cranium. Accordingly, the sick headach may be cured or relieved by spontaneous bleeding from the nose, or other similar remedies applied to

the head; but is not alleviated by purging, and is always aggravated by the stimulants which relieve dyspepsia. This kind of headach not uncommonly occurs as a vicarious affection with epilepsy.

(DCCXIII.)

Of the same nature is the common headach which afflicts nervous patients, without sickness; and which, also, is usually and erroneously attributed to the alimentary canal, and therefore aggravated almost to madness by the improper means, whether of regimen or medicine, which are generally ordered for its relief.

(DCCXIV.)

It may, however, without hazard be asserted, that dyspepsia is so far from being usually a cause of headach, and other affections which pass under the name of Nervous, that they rarely accompany each other. This subject will be farther discussed as we proceed.

(DCCXV.)

But whatever be the more remote cause, this pain, whether affecting the exterior or interior part of the head, is usually accompanied with such a state of the circulation in the carotids, heat of the head, coldness of the feet, and other circumstances, as indicate its more immediate cause to be excessive determination of blood to that part. Thus, it is usually increased by heat, stimulating food and drink, by exercise, and by every other cause which excites additional force or quickness in the action of the heart. When, also, it

is of a throbbing kind, as is very frequently the case, each throb, or aggravation of pain, is synchronous with a systole of the left ventricle of the heart, and, therefore, with a new impulse of blood in the arteries of the head.

(DCCXVI.)

On the other hand, it is diminished by whatever diminishes the action of the heart, changes the determination of blood to some other part, or directly diminishes it to the head. Hence it is relieved by cold applied to the head, and, when external, by a firm bandage round that part; by rest; by blood-letting, under certain modifications; sometimes by warmth applied to the feet; by compressing one or both carotids, and, as appears by the publications of Mr. Astley Cooper and Mr. Travers, by tying the carotid artery on the side affected with pain.

(DCCXVII.)

The term Vertigo is certainly applied to at least two different species of sensation in the head.

The first, and proper, species is characterized by a feeling of quick rotation in the inside of the head; and, I believe, it is this species which precedes epileptic, paralytic, and apoplectic attacks. In a moment after its commencement, the patient is often seized with nausea, and sometimes with vomiting; and, at other times, almost immediately falls senseless.

(DCCXVIII.)

Another species is distinguished by a sensation, as if objects were approaching us, or more usually receding from us, and becoming dark. This is the feeling which frequently occurs, when, after stooping, one suddenly rises up into the erect posture. In its symptoms it is very different from the former; is rarely, if ever, accompanied with sickness, and ought rather to be called Swimming, than Giddiness or Vertigo. I believe, also, that it arises from a state of circulation totally opposite to that in the former case; for while, in vertigo, there is a greater impulse of blood to the brain than is natural, the sensation in swimming arises from the want of due impetus in the cerebral vessels. This difference is proved by these farther circumstances, that true vertigo may be relieved by blood-letting and compression of the carotids, while swimming is increased by the compression, and is actually similar to the feeling which precedes syncope from blood-letting.

(DCCXIX.)

That vertigo is only another modification of that state of excessive impulse, which produces headach, is evident from its often alternating with that affection, and forming with it a part of the series, which occurs in other excessive determinations to the brain.

(DCCXX.)

Among these determinations may be reckoned Epilepsy; which, whatever may be its primary causes,

usually depends immediately on excessive impetus of blood in the vessels of the brain. It, therefore, is most apt to occur to persons, who are subject to headach, vertigo, and unquiet, dreaming sleep; and the approach of its fits is generally preceded by an uncommon degree of those symptoms. In many instances, vertigo is an immediate prelude to the paroxysm; and I have known it a vicarious affection for epilepsy.

(DCCXXI.)

The symptoms of epilepsy are, more or less, of a convulsive, or even strongly contracted, state of various muscles, as chiefly those of the eyes, face, tongue, neck, throat, upper extremities, and of respiration; usually accompanied with loss of sense, and followed by a longer or shorter stupor, in which the respiration is sometimes, but not always, stertorous. Now, as the parts chiefly affected are those, which are supplied by nerves of the encephalon, and as the functions of the brain itself are so greatly disturbed during and after the paroxysm, we can scarcely avoid referring the cause, whatever it may be, to the brain.

(DCCXXII.)

That this cause is owing to the state of circulation, is probable, from the suddenness of the attacks, and the perfect interval which exists between them; both of which circumstances imply the operation of a fluctuating cause, which we cannot well conceive to be any other than one of those sudden changes, which we continually see occurring in the sanguiferous system.

(DCCXXIII.)

That it is also owing to excessive impulse, is probable, not only from the analogical power of mechanical irritations of the brain to produce convulsions, but from the occurrence of convulsions, in this case, in the series of headach, or vertigo, or both, which have been before proved to originate from the same cause. I have known epilepsy occur indiscriminately with sick headach; disappear, as that was cured; and return, several years afterwards, as, from the imprudence of the patient, the sick headach also returned.

(DCCXXIV.)

Epilepsy is, also, most apt to affect young persons, who are well known to be most liable to diseases accompanying the nervous temperament; and of these more especially females, who have not yet reached the period of fully established menstruation. At a more advanced age, it chiefly attacks those who have long been constitutionally nervous, or who have lost the accustomed excessive sanguineous determinations of gout, hæmorrhages from the nose, hæmorrhoids, ulcers, eruptions, &c.; and, in all these cases, the pulse in the carotid arteries is habitually stronger than natural. It is often one modification of that increased determination to the head, which attends dentition; and not rarely comes on in that stage of the cold fit of agues, and before the eruption in certain other fevers, when the blood is accumulated about the heart and large vessels. I have seen it form one link in the chain of excessive determinations

following scarlatina, of which articular inflammation, hæmorrhage from the kidnies, and anasarca, constituted the preceding links. It frequently follows hysteria, or mania, or alternates with them. In several instances, I have known, in the same patient, paroxysms occur, at different times, in all the intermediate degrees between common hysteria and the severest epilepsy. Lastly, it often terminates in, or is exchanged for, sanguineous, or serous, extravasasion in the brain, and consequent hemiplegia, or apoplexy, whether hemiplegic, or otherwise.

(DCCXXV.)

The more immediate approach of fits is sometimes denoted by a flushing, and sense of fulness about the head, and noises in the ears; and where there is bronchocele, which is not uncommonly the case, by an increase of swelling and uneasiness in the gland so affected. In one case, the approach was indicated by a stuffing of the nose, as if from a violent cold in the head.

(DCCXXVI.)

In the epileptic fit itself, the face is flushed, and hot, and often sweating; and blood is driven with force into the extreme vessels of the head, frequently producing eruptions on the skin, which I have always seen confined to the face and neck only, and which have usually disappeared in three or four days after the fit. The pulse in the carotids, when it can be felt, is preternaturally strong and full.

(DCCXXVII.)

Epileptic fits are often produced, or excited, by those causes, which occasion inflammation and hæmorrhage; as insolation, violent exercise, especially in hot weather; a sudden rise of temperature in the air, hot bathing, full meals, strong drink, Venus nimia, anger, surprise, and other causes increasing the action of the heart.

(DCCXXVIII.)

Lastly, I have seen several instances, in which fits immediately followed violent palpitation of the heart; which, in one of the cases, was excited merely by a disagreeable smell, and produced the paroxysm in a patient, who was never before so affected. It may, indeed, with great reason, be doubted, whether palpitation be not a prelude to the fit in most cases; although, in many, the approach of the paroxysm is so rapid, that the true series of symptoms eludes, or escapes, observation.

(DCCXXIX.)

Epileptic attacks are, more or less, prevented by whatever habitually diminishes the excessive action of the heart, or lessens the flow of blood to the head. Thus it is often superseded by gout. In more than one instance, the paroxysm has been removed by affusion of cold water, and in others, by compressing the carotid arteries; an operation, which, in this malady, is seldom practicable, on account of the

convulsive motions or strong contraction of the sterno-mastoid muscles, so frequent in such cases.

(DCCXXX.)

All these circumstances are decisive proofs of the usual cause of epilepsy.

(DCCXXXI.)

It is scarcely necessary to advert here to the theory of the brothers WENZEL, who attribute idiopathic epilepsy to a change produced on the pituitary gland, which they choose to call Cervelet; because the assumption of different causes of the same degree of proximity, in different cases of epilepsy, so as to establish a real distinction between idiopathic and symptomatic epilepsy, appears to me equally unphilosophical, and void of proof; and because I am, from my own observation, persuaded, that the various appearances of the pituitary gland, during what may be called the healthy state of the encephalon, are not hitherto sufficiently understood to enable us to ascertain the morbid changes of that part, so as to identify them with any particular disease.

(DCCXXXII.)

To this conclusion, as to the usual cause of epilepsy, it may be objected, that it often evidently arises from exostoses, and other local diseases in the cranium. Even in those cases, however, in which dissection shews the existence of such local affections, we know

that the disease still attacks only in paroxysms, and that such paroxysms are usually produced by one or other of the exciting causes already detailed. Hence it may reasonably be inferred, that these local disorders act merely as causes of predisposition; which usually require, for the production of the fit, the coincidence of the same causes as those which are necessary in other cases, and all of which manifestly operate by increased impetus of blood.

(DCCXXXIII.)

Besides which, when we consider the nature of these local disorders, it may justly be doubted, whether, conformably to the principles stated in (CCCVII.) they are not themselves all generated by the violence, or frequent repetition, of that impetus of blood, which, in the very same individual case, might have produced fits, before these errors of structure began to exist. In this view, such exostoses, &c. may be considered as collateral effects of the cause producing the fits.

(DCCXXXIV.)

At the utmost, they may probably, as I have before observed, be considered as mere predisposing causes, occasioning a tendency to paroxysms from a degree of impetus less excessive than that, which would have been necessary without them.

(DCCXXXV.)

The opinion here advanced, as to the cause of

epilepsy, will derive still greater strength, when we farther pursue the subject of Convulsions, which, for the most part, exist, in a greater or less degree, in that malady.

(DCCXXXVI.)

It has been above stated, that convulsions are a frequent occurrence in the series of reputed nervous affections; and by the very striking case above quoted,* it has been demonstrated, that they may depend on excessive impetus of the blood in the vessels of the brain, since in that case they were removed by interrupting or diminishing the flow of blood through the carotid arteries to that organ; in consequence of which, a state of sopor often ensued.

(DCCXXXVII.)

Of this kind, another example was communicated by me to the Royal Society, and has since been published in the Philosophical Transactions.† In this case, a constant twitching of certain fibres of the flexor muscles of the forearm was uniformly suspended by compression of the carotid artery on the opposite side, while it was not diminished by pressure of the carotid on the same side.

(DCCXXXVIII.)

These facts serve at once to shew the nature of the

* London Medical Memoirs, vol. iii. p. 77.

† For the year 1811, p. 89.

convulsions in what are called nervous cases; and add irresistible force to the conclusion as to the cause of epilepsy, of which convulsions form so considerable a part.

(DCCXXXIX.)

I am, indeed, very far from asserting, that convulsions always arise from increased impulse of blood in the vessels of the brain. On the contrary, after having tied up both carotids in a sheep, and afterwards opened one of them below the ligature, I saw violent convulsions accompany the hæmorrhage, immediately before the death of the animal.

(DCCXL.)

So, also, as already remarked, with regard to gout in the lower extremities, the excessive determination of blood to the muscles of those parts, accompanying that malady, will produce in them inordinate and spasmodic motions.

(DCCXLI.)

The question, however, is not, what causes of particular affections may exist, but what cause does actually exist in the individual case under consideration; and I think it has been proved, that excessive determination of blood to the vessels of the brain is the cause of the convulsions in the various disorders already mentioned, in which there is evidence of excessive cerebral irritation.

(DCCXLII.)

So, also, it is probable, that Subsultus Tendinum, Convulsive motions of the limbs, and Hiccup, which often concur with delirium in various fevers, arise from long or violent irritation of the brain by sanguineous impulse.

(DCCXLIII.)

I am unable to ascertain the origin of the Tremors, or Shiverings, which often attend very painful disorders, as gout, and the effort to pass gall-stones, in cases in which there are no marks of considerable local inflammation, and in which there is neither coexisting coldness, nor subsequent fever. Of the final cause of these tremors, as well as of shivering in general, I shall have occasion hereafter to speak.

(DCCXLIV.)

There is one species of convulsion, well known under the name of Chorea, or St. Vitus's Dance, with which every voluntary muscle in the body is liable to be affected. It consists of an irregular catching motion, chiefly existing while the muscles are thrown into action during the process of volition. That it owes its origin to some affection of the brain, is probable, because it is increased by mental agitation, and, for the most part, ceases during sleep. How far this disorder, in all cases, depends on excessive impulse of blood in the brain, it is difficult to ascertain; but it seems occasionally to depend on that cause, since it is aggravated by whatever increases the

action of the heart. It also occurred in one person, who had afterwards fatal epilepsy from sanguineous extravasation in the brain; and, in another, succeeded attacks of that disease.

(DCCXLV.)

Stammering seems to arise from two causes, of which the first is mental uncertainty and hesitation; and the second, a mere convulsive affection of the muscles concerned in speech. In the first case, it may be only a moral habit, unconnected with disease; but, in the second case, I have seen it form a part of that series of cerebral affections, of which epilepsy, hysteria, headach, vertigo, and spasmodic cough, made other parts. We may, therefore, fairly conclude it to result from the same cause, or increased determination to the brain.

(DCCXLVI.)

Akin, but not precisely similar, to the two last complaints, is what is called the Shaking Palsy, in which the head and limbs shake, more especially on any muscular exertion. I should be disposed to deny the justice of the name which is given to this disorder, had I not once seen it affect that side only, in which the patient had suffered a paralytic stroke. Perhaps, indeed, this instance itself would furnish no real exception to that objection, since the weakness of the side was the consequence of epilepsy, and not of apoplexy. More usually, however, it is a complaint which comes on by slow approaches. In a case, in

which it was confined to one arm only, it seemed to have arisen from mere rheumatism affecting the shoulder of the arm which was so convulsed. That it always originates in the brain, we therefore must not assert.

(DCCXLVII.)

There is another malady, of doubtful origin, which is the Wry Neck, arising, in many cases, from an apparent difference in the tonicity of the two sterno-mastoid muscles; in consequence of which, one, apparently by excess of action, overdraws the other, and the chin gradually turns sideways, and somewhat upwards, on the side opposite to that on which the affected muscle is placed. Great force is often required in order to counteract this spasmodic contraction; in attempting which, the muscles on the other side become fatigued, and the head often shakes. In its symptoms, this disease is somewhat analogous to chorea, of which the worst case of wry neck, which I ever saw, was the sequel. As, in more than one instance of this troublesome malady, I have observed it to be suspended by attention to other objects, and by muscular exertion of other parts, whereas, on the contrary, when so suspended, it is always renewed, and, when existing, aggravated, by any circumstances which recal it to the memory; we can scarcely avoid considering it as having its origin in the brain. Since, also, it appears to be increased by whatever increases the action of the heart, and has, in my experience, been most effectually relieved by purging, blood-

letting, and cool bathing; I am disposed to suspect, though I cannot prove, that it originates in a state of determination of blood to the head, which, as in others of the cases which I have adduced, is either absolutely or relatively excessive.

(DCCXLVIII.)

The cause of the rigid spasms or convulsions of Tetanus, and of the convulsions of the respiratory organs, &c. in Rabies Contagiosa, has not, I believe, been hitherto discovered.

(DCCXLIX.)

The Sopor, which follows epileptic convulsions, seems to be merely that state of collapse, or indirect debility, of the brain, which is produced by vehement or long continued irritation from violently impelled blood. The fact, mentioned above, (DCCXXXVI.) of its production by pressure of the carotids, readily shews how it may occur in this disease, when the excessive impetus of blood has ceased. But the brain often seems to be so exhausted, that the sopor remains, even while the excessive impulse continues. It resembles sleep much more than the sopor of apoplexy. Even in fatal cases, in which all animal sensibility has been for two or three days apparently gone, and only the automatic powers of swallowing and breathing remain, the respiration, not more than two or three hours before death, will sometimes be in no degree stertorous, and the pupils will be strongly

contracted. In such cases, no organic malady of the brain is discoverable on dissection.

(DCCL.)

Hysteria appears to differ from epilepsy, partly in the muscles which it affects, but principally in the force of the several affections. The functions of the brain are more usually suspended by different degrees of mania, than by sopor. The muscles, chiefly suffering under the convulsions, are those of the extremities and trunk of the body, the diaphragm, and the alimentary canal. The Globus Hystericus is a spasmodic affection, sometimes appearing wholly in the pharynx, and influencing, by proximity, the larynx; but often beginning in the colon, and ascending to the throat, where it ends by a strong rising of the parts just specified, threatening suffocation. In some cases, there is a long continued spasmodic stricture of the parts concerned in respiration. The paroxysm often suddenly ends in a relaxation of the diaphragm, and of the other organs of respiration; in consequence of which, the patient, unable before to inspire freely, makes one or more deep sighs, and then often falls into a slight stupor, in which the cheeks are well coloured, and the heart properly performs its function. From this stupor the patient starts up, either spontaneously, or from any slight irritation, into another fit of convulsions, which ends as before; till, by degrees, the whole ceases. During the stupor, the patient often hears and remembers

what has, sometimes very incautiously, been said. This is the more violent form of Hysteria.

(DCCLI.)

In slighter cases, there is little more than a tendency to the globus hystericus, and those borborygmi, which so often occur, not only in epilepsy, but under even the weakest forms of nervous affection; together with occasional involuntary laughing or crying. In all, the spirits are in a very variable state, being suddenly raised or depressed, and both equally without any moral cause.

(DCCLII.)

Now as these attacks differ from those of epilepsy chiefly in degree, as they usually occur to females rather than to males, and to persons whose age, habits of life, constitution, and accidental causes of malady, are similar to those which dispose to epilepsy; and as they often alternate, in the same patient, with headach, vertigo, epilepsy, and mania, there is little reason to doubt that they arise from a similar affection of the encephalon.

(DCCLIII.)

Farther proof of a common origin of the two diseases, or excessive determination of blood to the brain, may be derived from the fact, that this malady, like the preceding, is apt to be excited by all those causes which increase the action of the heart, and the strength of pulsation in the carotid arteries; as heat,

highly stimulating ingesta, full meals, violent surprise, and certain other mental emotions.

(DCCLIV.)

This conclusion is strengthened by the redness and heat of face, and the headach, vertigo, or sense of weight or fulness in the head, to which hysterical patients are usually liable, either during the fits, or even in their intervals, and by the full pulse of the carotids; and it is ultimately established by the relief which is obtained, in such cases, by whatever diminishes the afflux of blood to the head; as the cessation of the inordinate action of the heart, the evacuation of the preternaturally distended vessels of the head by a flow of tears, artificial or spontaneous hæmorrhage from different branches of the carotids, determinations of blood to distant parts, affusion of cold water on the head, cold drinks, fear without surprise, and the compression of the carotid arteries.

(DCCLV.)

Into the supposed connection of this complaint with dyspepsia, I shall hereafter have occasion more fully to inquire.

(DCCLVI.)

Another state of disorder, which is simple depression of spirits, unconnected with any adequate afflictive cause, and usually called Hypochondriasis, I have deferred to mention till this place, because we have seen that it is a frequent occurrence in hysteria,

as it has just been described. It is, in fact, only one effect of that morbid sensibility, which has been noted as the characteristic of the nervous temperament; and from its being an usual concomitant of the symptoms which denote that temperament, we might legitimately infer that it arose from the same cause, excessive determination of blood to the brain.

(DCCLVII.)

The conclusion will, however, admit of direct proof. It is apt to be accompanied with flushing and heat about the face and head, and always, proportionably to its degree, with preternatural impulse of blood in the carotid arteries.

(DCCLVIII.)

It has, also, another coincidence, which, though in its own nature very instructive, has, from its frequency, failed to excite attention. In addition to the usual heat of the forehead, the patient is apt to feel, about that part, a sense of weight, fulness, or constriction, which is often followed by a flow of tears. When this flow has taken place, not only the bodily uneasiness of the patient, but the mental distress is immediately relieved. This is so much within common observation, that every one must have heard persons regret their inability to cry. This course of phænomena is exactly similar to what occurs in grief, from whatever cause; and since, in such cases, there are not only the bodily feelings about the head already described, but a redness about the eyes, a stuffing of

the nose, and an actual increase of prominence in the temporal arteries, we have full ground to conclude, that all the symptoms arise from preternatural determination of blood to the head, which the discharge of tears tends to remove, conformably to the general law, by which evacuation follows and relieves excessive determination of blood to other parts.

(DCCLIX.)

Of the disorders usually denominated nervous, one of the most afflictive is Insanity.

(DCCLX.)

This disorder is characterized by different states of mental aberration; of which one is an excessive sensibility with regard to all impressions, leading to a corresponding quickness as to consequent trains of thought and actions; so that imagination often supersedes accurate observation and reminiscence of the true quality and order of phænomena.

(DCCLXI.)

This state, which is only a greater extent of the common nervous temperament, is the ordinary beginning of Mania or Insanity. Persons are often conscious of it, and deplore it as the commencement of a more aggravated degree of the malady.

(DCCLXII.)

It seldom continues long; for some one train of thought is apt to predominate, so as sometimes, almost

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completely, to exclude others, which are scarcely admitted into the mental process.

(DCCLXIII.)

Here, therefore, such a recollection of the quality and order of past phænomena, and such an observation of those which are present, as, taken together, are the basis of judgment, are more defective than in the former state; and imagination, directed in one invariable course, altogether prevails. This constitutes the second stage, and, indeed, the most usual appearance of insanity.

(DCCLXIV.)

As we constantly observe, that, during the healthiest condition of the bodily and mental frame, attention is forcibly called to those objects, and all the circumstances relating to them, which make a strong predominant impression on the mind, so we have no difficulty in understanding how excessive sensibility may dispose to the same effect from moderate impression.

(DCCLXV.)

Hence, then, it appears, that the actual mental feeling will be in the compound ratio of the degree of sensibility, and the force of the impression.

(DCCLXVI.)

Now the particular tendency of the thoughts and actions in such cases, whether to joy, sorrow, despair,

ambition, love, anger, &c. will be dependent chiefly on the prior mental propensities, or habits, of the patient, but occasionally on the species or force of the circumstances producing the disease.

(DCCLXVII.)

The state, just described, is only an excessive degree of that which is called Absence, and which occurs to persons who are in health, but are acted upon by strong passions or objects of pursuit, which supersede attention to other objects. We see the effect of this predominating attention in violent fits of anger, which was of old denominated "short madness;" and in the more permanent passion of love, by which the mind is sometimes so wholly engrossed, that the sufferer is scarcely conscious of the common wants of nature. Even subjects of profound study have been often known so to occupy the attention, as to shut out all sense of immediate personal danger. The fate of ARCHIMEDES furnishes an example of this deep abstraction, well known to all persons conversant with ancient history.

(DCCLXVIII.)

When habits of yielding to first impressions, and the immediate gratification of first emotions, have been indulged, when prejudices, uncorrected by reason, have been cherished, and the mind has been as it were voluntarily closed against the reception of truth, this is moral insanity, which, in a certain

degree, is too common to the wisest and best of mankind.

(DCCLXIX.)

In the greatest degree, however, in which this state occurs, we well know that it is not cognizable by law, unless it leads to practices, which injure or threaten the property or personal safety of others.

(DCCLXX.)

Besides this moral insanity, there is doubtless a physical one, which may occur to the best regulated mind; and that from causes immediately acting on the brain. We see this effect from febrile diseases; and an accidental blow on the head has been known to pervert all the best principles of the human mind, and to change a pious christian to a drunkard and abandoned felon.

(DCCLXXI.)

We may suppose that these, and similar, causes may act by destroying the balance of perceptive power in the brain in one of two ways; first, by increasing the sensibility of that organ, so as eventually to produce the preponderance resulting from it, which I have before explained; and, secondly, by rendering certain parts of the brain unfit for the performance of their functions, while other parts have their power unimpaired, or, perhaps, even morbidly increased. Which of these states takes place in the respective cases, I am unable to decide.

(DCCLXXII.)

If, in any case, it should happen, that this physical insanity concurs with the moral insanity before described, the situation of such a patient is indeed deplorable, and affords little hope of recovery. Such a concurrence is very common.

(DCCLXXIII.)

In reality, although the malady often begins in physical insanity, and the mind is afterwards forcibly urged towards one preponderating train of thought and action, this is not always the course of the phænomena. On many occasions, the order is inverted; and the patient suffers the loss of some dear friend, or of fortune; or undergoes the deep affliction of a troubled conscience, &c. These feelings, and consequent trains of thought, taking firm and undue possession of the mind, severally act on the bodily functions, and ultimately on the brain, so as to add physical insanity to culpable indulgence of mental emotions. We may, indeed, assume it as a matter of fact, that, however violent may be the emotions leading to insanity, they would, conformably to the moral nature of man, gradually and ultimately subside, were they not followed by some disorder of the brain itself.

(DCCLXXIV.)

It is easy to see how such a prevailing train of thought, as occurs under this head, may warp the judgment, so as to occasion misconceptions of the

causes or consequences of the most simple events, and consequent determinations of thought and errors of conduct.

(DCCLXXV.)

A third variety in the condition of insanity is that, in which the mind has the same perceptions as those, which are supposed to arise from impressions made by the real objects, which usually excite them. Thus, spectres of various kinds present themselves to the eyes, not only in darkness, but in the strongest light.

(DCCLXXVI.)

Here there is not, as in the former case, a mere error of judgment; but the sense, or rather probably, that part of the brain which is the ultimate organ of the sense, suffers precisely the same impressions as usually take place through the retina from visible objects. When these impressions occur with only a certain degree of distinctness and strength, as in the instance of flitting faces, &c. which most persons in tolerably good health have witnessed, the error is corrected by the judgment, and the deception is understood. But we know that, sometimes, the force of the impression is full as great as from the realities themselves; and when this is the case, more especially if the object accord with any habit or prepossession of mind, it is obvious that no process of reasoning will induce the patient to disbelieve what results from the plain evidence of his senses.

(DCCLXXVII.)

This kind of false perception, which an advocate for the philosophy of BERKELEY would find no weak support of his system, has given occasion to many of the more precise relations of ghosts and apparitions. The true theory must have occurred to every medical practitioner of extensive experience. The subject has been discussed by Dr. ALDERSON, and more recently and copiously by Dr. FERRIAR, who has given an excellent collection of examples of this modification of disease, highly interesting not only to medical, but to other readers.

(DCCLXXVIII.)

In some cases of insanity, such spectres are very apt to repeat their visits, with little variation of appearance; and it may easily be conceived that all the patients' trains of thought and action will follow that path, in which so impressive a reality must lead them.

(DCCLXXIX.)

In this instance, there is no defect whatever in the rational faculty, except some slight preponderance of the trains of thought connected with the spectre; because the exercise of reason itself is founded on what is called the evidence of the senses, which here is strong and distinct.

(DCCLXXX.)

That which, in such cases, confirms the deception,

is, that it sometimes affects more senses than one; so that such spectres are not only clearly seen, but are heard distinctly to speak and rationally converse.

(DCCLXXXI.)

To persons so impressed, it cannot be objected that such objects want the evidence, which would be derived from the touch; because it is assumed that they are spiritual beings, aërial forms, which, however capable they may be of being seen or heard, cannot be touched or felt. What then is there wanting to establish, in the mind of the patient, a complete conviction of the existence of such objects, as the ground both of thought and conduct?

(DCCLXXXII.)

If these spectres, so closely imitating the perception of what are considered as realities, are capable of being produced in the mind either immediately through the brain, or ultimately on it through the medium of the nerves, by causes different from the operation of the objects which commonly excite them, it is not improbable that various states of brain usually connected with corresponding trains of thought in the mind, may originate in the same morbid way.

(DCCLXXXIII.)

I have already remarked, that a general deficiency, either of the power of accurately perceiving, or of recollecting, a number of phænomena sufficient to enable a man to judge of the relations of those ideas.

with which he is most conversant, constitutes desipiency. This state is a frequent termination of insanity.

(DCCLXXXIV.)

This subject my be illustrated by the phænomena of Dreaming. In each fit of this kind, sleep is, in a certain degree, interrupted by the existence of some one idea, or train of ideas only; the power of receiving other ideas, and the trains connected with them, being at the same time wholly wanting; in consequence of which, the mind does not detect the delusion, till the person awakes, and, on recollecting his sleeping fancies, discovers, by the introduction of new ideas, of which he is now capable, that he had been only dreaming. It would be easy to shew, that many of these dreams arise from immediate impressions on certain bodily organs, exciting, through the brain only, those trains of thought, or even muscular actions, whether automatic, voluntary, or mixed, with which they are usually associated during waking.

(DCCLXXXV.)

It is not, however, essential to this process, that an impression from without should be made on any organ of sense. Such changes may directly take place in the brain, as either produce spectres, or are usually associated with certain ideas, and corresponding actions; all of which, in either case, then occur, and are not corrected by those collateral impressions or ideas, which would exist during a state of healthy watchfulness.

(DCCLXXXVI.)

Hence it appears, that each fit of dreaming includes only the two last states of physical insanity; first, confined and overbearing ideas, or trains of thought, occasionally followed by associated actions; and secondly, chimerical perceptions.

(DCCLXXXVII.)

I have called each train of thought a fit of dreaming; but we know that the quality of the ideas will be changed, so that one train will give place to another, without any remembrance of concatenation; whether it be, that, in such cases, no real concatenation may have existed, or, that we have forgotten the connection.

(DCCLXXXVIII.)

The Delirium of Fever is, probably, of different kinds in different cases. Its earliest and least degree appears exactly to coincide with the incipient stage of insanity, and is characterised only by extraordinary acuteness of perception, and rapidity of thought, rarely leading to violence or extravagance of action. Next occurs a state very similar to that of dreaming, as just described. The patient, when left to himself, though often lying with his eyes open, is little, if at all, sensible of the objects around him. He is, as it were, asleep; having automatic trains of thought, and perhaps, occasional chimerical perceptions. Both are quickly evanescent, and frequently repeated; but easily interrupted, either by momentary oblivion, or

by wakefulness, into which the patient is roused by some ordinary impressions, so as to answer a few simple questions, and then relapse into the former state of general oblivion, and incoherent wandering.

(DCCLXXXIX.)

The answers themselves are short, rarely consisting of more than one or two words; which are evidently automatic, and not the expression of the true state of the patient, derived from any consciousness of his own condition.

(DCCXC.)

Under another modification of febrile delirium, there is an almost incessant expression of quickly occurring ideas, incapable of any interruption by natural and healthy impressions, and followed by hasty and uncontrolable actions.

(DCCXCI.)

It seems, then, as if insanity and delirium, in their different modifications, consisted of various degrees and intermixtures of the three states of excessive acuteness of general perception, preponderance of particular ideas, or trains of thought, and chimerical perception.

(DCCXCII.)

So far as to the metaphysical nature of insanity and delirium.

(DCCXCIII.)

With regard to their physical cause, we must evidently look for it in that part, which is the mental organ.

(DCCXCIV.)

And here we have already seen,

First, that the phænomena are capable of being produced by that increased impetus of blood in the brain, which accompanies inflammation either of the white fibrous substance, or of the pia mater, which is the membrane supplying its blood.

Secondly, that the morbid sensibility of nervous patients, the nervous mania in hysteria and epilepsy, and the delirium of idiopathic fevers, arise from the same impetus, rarely, perhaps, carried to inflammation.

(DCCXCV.)

That other causes may produce a similar effect, cannot be denied. Thus, the delirium of drunkenness seems, in general, to arise from a source different from mere impetus of blood; though, in some persons, a certain quantity of strong drink will produce a modification of cerebral affection distinct from common intoxication, and which falls within the limits of true insanity. So, also, the effects of certain gases, and other poisons, will disorder the intellectual faculties by some operation, different from that of mere sanguineous impulse. A somewhat similar

change is often produced on the brain by mechanical concussion.

(DCCXCVI.)

It is, however, certain, that the condition induced by these powers is such as makes the brain approach to that state, which arises from excessive impetus of blood. This state we may suppose to be the proximate cause of the malady, while increased impetus of blood is only a remote or exciting cause. Thus, a quantity of wine, short of that which would have been necessary for intoxication, has produced a relapse of mania; and many persons never have epilepsy, except after the internal use of some form of alkohol, in different doses. So, also, of two gentlemen, each of whom drank in a day a bottle of rum, a bottle of gin, and two bottles of Madeira, one had for many weeks repeated attacks of epilepsy, followed by occasional chimerical perceptions; and the other became directly maniacal, and was obliged to suffer long coercion.

(DCCXCVII.)

In these cases we may, perhaps, conclude,

First, that the condition of brain, produced by such causes, is similar to that, which usually follows increased impetus of blood; and,

Secondly, that this condition disposes the brain to be excessively acted on by a degree of impetus, which, under other conditions of that organ, would produce no disorder.

(DCCXCVIII.)

Although, however, we see that great disturbance of the mental functions, and even the total death of the brain, may arise from causes, which do not act through excessive impetus of blood, yet, as the latter cause is evidently most often productive of the same effect, we should be disposed to infer its existence in other cases, in which the operation of other causes of a specific kind cannot be discovered.

(DCCXCIX.)

It is a strong evidence of the existence of this excessive impetus, as the usual cause of insanity, that we often see it follow suppressed discharges, or the disappearance of such local disorders, as, if the conclusions formed in the preceding pages be just, originate in a similar state of circulation. So, also, on the other hand, long maniacal diseases often either end in fatal affections of the brain, as epilepsy, hydrocephalus, or apoplexy; or are spontaneously cured by the supervention of any of those maladies of other parts, which I have attributed to increased momentum of blood; as inflammation, or hæmorrhagic and dropsical or other effusions or discharges; and simple increased determinations, as asthma, &c.

(DCCC.)

So, also, if in long diseases of this kind, the approach to death often completely removes the symptoms, and restores the patient to the full possession of his rational powers, we may easily conceive,

how this may arise from the diminished impetus of blood, either in any particular part, or in the whole, of the sanguiferous system of the brain; just as we have found the same state, as well as hæmorrhage, remove deafness originating in a similar increased momentum, or vascular fulness.

(DCCCI.)

Insanity is aggravated, and often produced, by any strong stimuli on the brain, or general sanguiferous system; such as insolation, other modes of external heat, violent exercise, stimulating drinks, certain medicines increasing the action of the heart, various mental emotions, mechanical injuries, &c.; and it is diminished by moral regimen, which restrains mental emotions, and by those causes which diminish the action of the heart. I have seen this latter connection so strongly marked, that the symptoms have diminished, or increased, precisely in proportion as the heart's action was retarded by the operation of digitalis, or gradually accelerated by the cessation of the influence of that remedy.

(DCCCII.)

In almost all cases of permanent insanity, and during all the paroxysms of occasional insanity, the impulse of blood in the carotid arteries is preternaturally strong.

(DCCCIII.)

It has been stated above, that the paroxysms of hysterical mania have been often removed

by the compression of one or both of those arteries.

(DCCCIV.)

It will have been remarked, that the pulsation of the carotid arteries has been said to be *usually* too strong in cases, whether of insanity, or of the various other excessive determinations to the head, which have been enumerated; and I cannot any where, better than in this place, obviate the apparent inconsistency of this expression.

(DCCCV.)

Here, therefore, it should be observed, first, that I have already admitted the existence of disease from mere local fulness, and therefore excessive local momentum, where excessive general momentum did not exist. The difference, which, on some occasions, occurs in this respect with regard to different branches, arising even immediately from the same arterial trunk, is so astonishingly great, that it could not be believed without the evidence of actual observation. Thus I have many times known the pulse in the temporal artery so weak, that blood would not flow from it, however well it was punctured; and other instances, in which it was too weak to be felt; and yet, in all the pulse in the carotid has been extremely strong, and there has been the most decisive evidence of preternatural impulse of blood in the brain. If, therefore, such a difference of impulse can exist in two sets of vessels derived from the same trunk, and so near to each other, we may readily conceive the internal

branches and the capillaries, arising from this artery, to be, on other occasions, sufficiently full to produce all the symptoms, without any increase of fulness in the trunk of the carotid.

(DCCCVI.)

Neither are we acquainted with the share, which, on various occasions, the vertebral arteries may have in the production of these effects. In one recent case of habitual vertigo, and other symptoms of habitual determination of blood to the brain, which ended in sudden and immediate death from cerebral hæmorrhage, the basilar artery was found much larger than is natural in persons dying of other diseases.

(DCCCVII.)

Farther; it has been before remarked, that, in many patients, the paroxysms of insanity, like those of epilepsy, are only temporary; and this was the case with regard to one of the worst examples, which has ever occurred to me, of the former disorder. In such cases, the excessive impetus being only an occasional and temporary occurrence, its continuance, during the intervals of health, is not to be expected; and, indeed, is not at all essential to the conclusion which I have attempted to establish.

(DCCCVIII.)

If, also, a person shall die, from the effects on the brain, of drunkenness, opium, or concussion, in consequence of changes so subtle, as to elude the nicest

scrutiny of which we are capable ; we cannot wonder, that increased momentum may kill, by producing on the brain changes equally incognizable by our senses; which changes may be incompatible with the life of that organ, though the increased impetus, which produced them, may have ceased.

(DCCCIX.)

This is conformable to actual experience, in epilepsy as well as mania ; in both of which, although, in dissecting the encephalon, we often see preternatural hardness, softness, opacity, transparency, colour, thickening, vascularity, effusion, or other consequences, justly attributable to excessive impetus of blood, we can, on other occasions, discover no change by which to explain the symptoms or fatal event.

(DCCCX.)

On the whole, from the analogies and direct facts above adduced, it seems highly probable, that the common cause of insanity is increased momentum of blood in the vessels of the brain ; which may be followed either by that indirect debility, called Fatuity, Desipiency, or Ideotism, or by certain organic changes, which, as they exist with or without a continuance of the excessive momentum, may produce various modifications of aberration from the due exercise of the mental capacities or powers.

(DCCCXI.)

There is a disease, which, all circumstances con-

sidered, is one of the most extraordinary to which the human frame is liable. This is Catalepsy; which I have seen affect one limb only, or the whole body.

(DCCCXII.)

In a violent case of the latter kind, accompanied with total insensibility, pressure on both carotids uniformly suspended the symptoms, and restored the patient's senses; while pressure on one carotid only had no perceptible effect.

(DCCCXIII.)

That this condition of disease is merely a different modification or degree of that which constitutes convulsions, is evident from this fact; that, in the example just mentioned, a moderate and ineffectual degree of pressure on the carotids removed the catalepsy, and induced convulsions, while a greater degree removed the convulsions also. The converse order of occurrences was equally true.

(DCCCXIV.)

These are the chief maladies, usually denominated Nervous, which appear to me derived from excessive determination of blood to the brain.

(DCCCXV.)

I may here extend to all these diseases, the remark which has been already made with regard to some, that, on different occasions, they form parts of the same series, and, therefore, must be considered as only

different modifications of effect from one common cause. This subject will receive farther amplification hereafter.

(DCCCXVI.)

The same conclusion will follow from a knowledge of the frequent terminations of cases, in which some or or other of these states of excessive determination of blood to the brain have, with more or less of frequency or duration, taken place.

(DCCCXVII.)

These terminations are chiefly extravasation of fluid in the ventricles of the brain, or between the more external folds of the tunica arachnoides ; or of entire blood in the same parts, or in the medullary substance itself.

(DCCCXVIII.)

Hydrocephalus Internus, characterised by the effusion of clear fluid, chiefly into the lateral ventricles of the brain, is, generally, an acute febrile disease proving fatal in from eighteen to twenty days from the first symptoms of malady about the head. Under this form, ever since the inaugural dissertation of Dr. Quin, hydrocephalus internus has been considered as an inflammatory affection. It is certain, that, in such cases, blood drawn from the arm, and even from the temporal artery, often exhibits the inflammatory crust. If, however, the lateral ventricles, conformably to the opinion of Bichât, are lined with a production of

the tunica arachnoides, which he judges to be a serous membrane, the fluid in the ventricles does not, in such cases, shew the chemical qualities of that, which, in inflammation, is usually poured out from such membranes.

(DCCCXIX.)

Whether, however, inflammation exist in acute hydrocephalus, or not, all the previous and concomitant symptoms are those which shew increased impetus; and thus, if the general principle, which I have endeavoured to establish with regard to dropsies, be well founded, this disease, and the other symptoms, attributed to increased determination of blood to the brain, throw mutual light on each other.

(DCCCXX.)

Hydrocephalus internus, though most common in young children, occurs to persons even of adult age, who have been accustomed to headachs, and especially to that, which I have already noticed as the Sick Headach of authors. In all cases, it begins with pain of the head, and more or less of vertigo; sometimes with epilepsy, and more rarely with slight hemiplegia. In children of four or five years of age, there are often evident marks of peculiar nervous irritability. Symptomatic vomiting is a very early symptom; and the disease, in its progress, is accompanied with impatience of light, and convulsions, which I have more than once seen include true globus hystericus.

(DCCCXXI.)

Hydrocephalus is no unfrequent termination of common epilepsy, in persons of adult, middle, or advanced age.

(DCCCXXII.)

Hydrocephalus Externus, to any considerable extent, is certainly a rare occurrence. When in a slighter degree, it is situated either between the tunica arachnoides and pia mater, or in the duplicature of the former membrane between the pia and dura mater. In these cases, as I have before observed, it is usually the evident result of inflammation. This process is often performed very rapidly; and the fluid effused is sometimes undoubtedly se ous, with a considerable proportion of albumen, which is thick, and occasionally tending to a pearly opacity.

(DCCCXXIII.)

If, in these cases of hydrocephalus internus and externus, the effusion is not always dependent on inflammation, still the symptoms preceding it are similar to those, which I have endeavoured to refer to excessive momentum of blood in the vessels of the head.

(DCCCXXIV.)

Another termination of excessive momentum of blood in the brain is hæmorrhage, producing Hemiplegia or Apoplexy.

(DCCCXXV.)

The more common seat of hæmorrhage is some part of the medullary substance of the cerebrum, and more rarely of the cerebellum. Less frequently, the extravasation is in one or more of the ventricles, &c.; and still more seldom, in the base of the cranium. A more particular account of the modifications of this malady will hereafter be given.

(DCCCXXVI.)

In the meanwhile, it is to be observed, that this disease is especially apt to occur to those persons, who subject themselves to the causes of the nervous temperament; that is, who live sedentary lives, eat and drink freely, and are inclined to obesity: those, also, who have lost accustomed discharges, as hæmorrhoids, &c. and other excessive determinations, as gout. Of the last series I have seen several examples, in which the cerebral hæmorrhage, demonstrated by dissection, was vicarious for the arthritic attack; instead of which, at the accustomed season of gout, hemiplegia occurred. This fact is peculiarly worthy of remark, because it proves the erroneousness of the common opinion, which assumes the cerebral affections attendant on, or constituting, atonic or misplaced gout, to be mere inexplicable nervous disorders.

(DCCCXXVII.)

Apoplexy is often preceded by some or other of the various symptoms, which I have attributed to increased determination of blood to the head; as

coldness of the feet, flushing of the face, pain or weight in the head, vertigo, noises in the ears, dreaming, unquiet sleep, depression of spirits, incapacity of attention, and often by epilepsy. It is usually accompanied with hemiplegia, or loss of motion, and sometime partial loss of sensation, on one side of the whole body; both of which symptoms are, doubtless, most clearly perceivable, when the hemiplegia exists without apoplexy, or continues after the apoplexy has disappeared. While, in apoplexy, one side is incapable of voluntary motion, the other side is often affected with twitchings or convulsions.

(DCCCXXVIII.)

Patients, who have suffered any degree of either of these two maladies, are generally affected with an unconquerable depression of spirits, often shewing itself in men, who were previously most athletic, by frequent tears.

(DCCCXXIX.)

In some instances, hemiplegia, like epilepsy, terminates in mania.

(DCCCXXX.)

Whether hemiplegia can exist without some degree of excessive pressure on the brain, has been doubted. I know, by dissection, that it can, where pressure has previously occurred, but has ceased.

(DCCCXXXI.)

It is probable, that simple excessive impulse, with accumulation of blood in the vessels themselves, without extravasation, may produce either apoplexy or hemiplegia. This is the seeming cause of those sudden partial palsies, accompanied sometimes with entire loss of sense, which occur in nervous affections, but in a few hours perfectly cease, soon leaving the patient in as good health as before.

(DCCCXXXII.)

I cannot tell whether the hemiplegia, which occasionally follows epilepsy, is not sometimes of the same nature. Many opportunities of knowing this, from dissection, have occurred to me; but as the physician is seldom permitted to judge what is best, either for the patient or the science, these, like a thousand others of inestimable value, have been lost.

(DCCCXXXIII.)

In one of the cases of Asphyxia from carbonic acid gas, recorded by Dr. Babington, there was some degree of paralysis of the face and arm on one side. In this instance, the opportunity of learning the cause was happily defeated by the skill and ardour of the physician. Slight extravasation in the brain might have taken place from that difficult transmission of blood through the lungs and right auricle of the heart, which must have occurred in this case.

(DCCCXXXIV.)

From the foregoing relation of facts, I think it clearly appears, first, that a large proportion of nervous affections originates in a disordered state of circulation with regard to the brain; just as inflammation, hæmorrhage, dropsy, and the various other maladies, which I have specified, arise from similar states of circulation in other parts; and, secondly, that this state is either absolute or relative excess of momentum, impetus, or determination of blood, in some portion of the arterial system of the part affected.

(DCCCXXXV.)

In addition to the last described class of disorders, which are of importance chiefly as they respect the brain, there are others, which often obtain the appellation of nervous, and which arise from affections of the Spinal Marrow, or other parts of the nervous system.

(DCCCXXXVI.)

Among these, we may first advert to that disease, which is called Paraplegia, or paralysis of the lower extremities. The disorder is not, indeed, confined to these parts, but sometimes, though more rarely, affects the hands. It consists of more or less of diminution of sensation, or voluntary motion, or both, to which are variously superadded tinglings, pains passing down the thighs and legs to the feet, and occasional spasmodic startings of the limbs, especially during the night. In most of the cases, the patient

can move the extremities, and can for a long time, even walk; but the recti femoris and tibiales antici muscles, together with the other extensors, are so weakened, that the toes are disposed to drop; and, in order to advance the legs, the patient is obliged to assist them, by endeavouring to keep the whole limb as strait as possible, and throwing the thigh forwards with a jerk, by means of the abdominal muscles.

(DCCCXXXVII.)

As the disease advances, the power of voluntary motion is often wholly lost; and sometimes the disorder extends half way, or more, up the trunk of the body, so that the patient cannot sit without being bound to his chair. In many instances, the hands and forearms come to be similarly affected. Even in the worst cases, in which the sensibility and capacity of motion in the parts are entirely gone, occasional spasmodic twitchings of the limbs continue.

(DCCCXXXVIII.)

In many patients, in whom the weakness of the lower limbs may not be considerable, there is a difficulty of retaining the urine, or stools, or both; but, sometimes, on the contrary, a difficulty of passing them.

(DCCCXXXIX.)

These complaints, when arising from incurvations, or other spontaneous or accidental injuries of the spine, are always considered as originating in mechanical irritation, or pressure on the medulla.

(DCCCXL.)

Many other cases, however, occur, in which a precisely similar disease cannot be attributed to either of those causes. These instances are often traceable either to violent exertion of the lower limbs, or to their exposure to cold, especially when conjoined with moisture.

(DCCCXLI.)

Of such a case, dissection has enabled me to trace the cause to excessive sanguineous fulness of the neurilema, or vascular membrane immediately enveloping the spinal marrow, unaccompanied with any disorder whatever of the bony canal; and experience has shewn me, that this redness may, in the progress of the disease, extend itself to different parts of the same membrane, and even to the pia mater of the brain, of which it is a continuation, producing effects, relative, in quality and place, to the several portions so affected.

(DCCCXLII.)

From what we are able to observe of the effects of different gradations of irritation or impulse on medullary substance, in living animals, whether of brain, spinal marrow, or nerves, we perceive that a certain degree of it produces pain or uneasiness, which is often propagated onwards in the course of the medullary branches. This, I think, is the origin of the aura epileptica, which begins in the brain. A greater effect is more or less of convulsion. An increase of impulse, amounting to pressure, abridges the capacity of sensation and voluntary motion. The greatest

impulse of all wholly destroys that of both. This is precisely analogous to what happens, to the parts dependent on the spinal marrow, from the various degrees of irritation or impulse, which are the usual causes of paraplegia.

(DCCCXLIII.)

A knowledge of the origin of different nerves enables us, on some occasions, so far to ascertain the place of the disorder in the spine, that, if the diminution of sensibility, or voluntary motion, exists in a certain part, the cause must be situated in the spine at least as high as the spot, from which the nerve supplying that part is derived.

(DCCCXLIV.)

The converse of this proposition, however, is not true; for the effect of a blow on the ulnar nerve, in the elbow, which produces a tingling in the little finger, shews that a disorder may be almost equally perceived in that part of a nerve which is considerably more distant from its origin, than the spot on which the irritation was made. This is indeed an illustration of the symptoms of the disease in question, which, though usually situated in the spinal marrow, is chiefly perceived in the limbs.

(DCCCXLV.)

The same principle may be extended still farther with regard to certain cases of this disease, in which the head is primarily affected with vertigo, and other

symptoms of excessive impulse, which are followed by paraplegia, accompanied, in some cases, with blindness. We seem, therefore, obliged to admit that the origin of the disease, in these last cases, is in the brain; unless we may conclude, that the same condition of increased vascularity may, at the same time, affect the investing membrane of the spinal marrow.

(DCCCXLVI.)

When the pia mater of the brain is thus circumstanced, various symptoms of cerebral disease, amounting, when in the greatest degree, to phrenitis, will occur.

(DCCCXLVII.)

How far the various paralytic affections of the extremities, which often follow colic from lead and other mineral poisons, and which sometimes arise from those poisons without the intervention of colic, or even from colic where no operation of poisons can be traced, may depend on any sensible disease of the spinal marrow, I am unable from experience to decide. Since, however, the term sympathy, to which it is customary to refer these effects, affords no determinate idea as to the cause, it is well worth while to examine, whether, in such maladies, there may not be found certain morbid states cognizable by our senses, and more capable of indicating rational and efficacious means of relief.

(DCCCXLVIII.)

It is asserted by Haller, and repeated by Mr.

Astley Cooper, that paralysis of the lower extremities is produced in dogs, in which the abdominal aorta has been tied; but no explanation has been attempted by either of those physiologists.

(DCCCXLIX.)

The effect of inflammation, either of the neurilema, or the parts immediately in contact with the sciatic nerve, in producing the disorder called Sciatica, was, I believe, first published by Cotunni. In such cases, the pain is, by the patient, often referred chiefly to the ramifications of that nerve on the outside of the knee, leg, and ankle. One may, however, often discover the origin of the complaint, by pressure behind the great trochanter; in which case, the patient will not only feel that part tender, but the pain of the knee and ankle will be much aggravated. In these cases, the affection seems sometimes to remove itself from the part, which it first occupied, downwards in the course of the nerve.

(DCCCL.)

A similar affection of the ulnar nerve occurs. Great pain and tenderness are felt about its upper portion in the humerus, extending down the arm to the little and ring fingers, both of which, after a longer or shorter period, become numbed.

(DCCCLI.)

To this head, also, may, probably, be referred that painful disorder called Tic Douloureux; which

seems to occupy the extreme ramifications either of the facial nerve, or of the second or superior maxillary branch of the trigeminus. All the circumstances induce me to attribute this pain to increased vascularity, or determination of blood (perhaps amounting to inflammation) to the neurilema, or vascular membranous envelope of those nerves. I form this judgment, first, from the strong analogy which the case itself bears to those before mentioned, in some of which dissection has demonstrated the cause: Secondly, from the extension of the disorder to the branches of more than one nerve in the same patient, which can scarcely be produced, but through the medium of common blood-vessels; since there is no evidence to prove the extension of pain, by pure sympathy, to anastomosing branches of nerves derived from different trunks: Thirdly, from the disposition in this pain to be increased or diminished by those means, which increase or diminish the motion of the heart: And, lastly, from the resemblance of curative effect produced on it, in common with those diseases, which evidently arise from excessive sanguineous determination, by certain remedies, such as abstraction of heat, eau medicinale, and arsenic.

(DCCCLII.)

To me it seems, that this conclusion is much supported by the result of the operation performed by Dr. Haighton, although a different inference is drawn from it by that acute physiologist. The circumstances, which he relates, rather prove the division

of the arterial branch supplying the affected ramification of the trigeminus nerve, than the division of that ramification itself. This conclusion is farther strengthened by the fact, which has occurred in some other cases, of a return of pain after the functions of the divided nerve have been restored by a regeneration of its substance; since it will readily be allowed, that, as the new nervous formation is the result of a certain action of blood-vessels, or capillaries, the morbid state must be produced by the same agents.

MANCHESTER MEDICAL SOCIETY.

ADDITIONAL PROOFS OF ONE COMMON ORIGIN OF DISEASES.

(DCCCLIII.)

TO the evidence of the general principle of increased determination or momentum of blood, deduced from the great mass of facts which I have related, additional weight may be given, from the different dispositions to disease, observable in different families. For, as it is acknowledged that one family is more liable than another to scrofula, another to gout, a third to eruptive complaints, a fourth to mania, &c.; so it is equally certain, that, in different individuals of the same family, there is a resemblance of modification in the several affections; which shews, that they are only varieties of the same common stock.

Thus, with regard to the head, I have known one person maniacal, a paternal cousin hæmorrhagic and epileptic, and almost all his children subject either to epilepsy, headach, bleeding at the nose, or hydrocephalus.

In another family, the mother was epileptic, a son laboured under long and excruciating headachs, and a daughter died of hydrocephalus.

Of two sisters, one was liable to eruptions on the face, the other to flushing heat of the whole head, and violent nervous affections, without eruption.

Of two other sisters, one died, at adult age, of hydrocephalus; and the other had a florid complexion, was greatly disposed to headach and hysteria, and had suffered a violent attack of erysipelas of the face and head.

In another family, a young female had headachs, great flushing in her face, and bleeding at the nose; her sister was highly nervous and irritable, and two brothers were maniacal.

Many other examples of the same kind might be adduced.

(DCCCLIV.)

To enumerate all the instances, in which these several disorders of the head occur, in different individuals of the same family, indiscriminately with inflammation and other diseases of excessive sanguineous determination in other parts, would, perhaps, be thought superfluous; because, in the foregoing pages of this work, I have attempted to shew that almost all the maladies, incidental to the animal frame, have this very circumstance of excessive momentum of blood, as one important common link in the great and connected chain of causes; that is, of uniformly preceding phænomena.

(DCCCLV.)

It will, however, add considerable strength to the

conclusion as to the constant existence of this link in the series of phænomena constituting the causes of these various maladies, if it can be shewn, that they are apt, in one set of persons, to extend, in different forms, and therefore often under different names, to different parts nearly at the same time; in another set, to affect one part, in one form, at one time, and, having ceased, to affect another part, in another form, at a subsequent time; and, lastly, in a third set, to leave one part or texture, and at the same or nearly the same time, to appear in the same, or some other, form, in another part or texture.

(DCCCLVI.)

Of all these kinds, examples have already been adduced, for the sake of the immediate illustration of other principles; but they will be repeated, where they may be found essential to the present view of the subject.

(DCCCLVII.)

And here, of diseases, or symptoms, known by different names, and affecting different parts nearly at the same time, we may specify, first, those which extend, by being joint affections of different, and even remote, branches of the same arterial trunks.

(DCCCLVIII.)

A case very illustrative of this principle was that of a man, who had violent rheumatic inflammation of the right shoulder. In this patient, the pulse in that

wrist was considerably fuller than in the other. That arm and hand were also hotter, and were disposed to sweat; while the left hand and arm, though clothed like the other, were cool, and perfectly dry; the man having no fire in his room.

When a determination of blood takes place to the bowels, in diarrhœas, &c. the muscles of the thighs and legs are often affected with aching pains, and cramps or spasmodic contractions, and the feet with burning heat.

During a gouty diathesis, a brisk purgative will often produce acutely inflammatory gout in the knees or feet.

Sciatica, actually existing, is often greatly aggravated by the operation of cathartic medicines.

When an excessive determination of blood takes place to the uterus, there is not only an aching in the loins, but often a violent pain in the groins, and down the thighs, in the direction of the external iliac arteries.

When to the capsular ligaments of joints, &c. in gout, the excessive determination frequently extends itself to the cutis, which becomes preternaturally red and hot; and, also, the muscles of the limb, which either is, has been, or is about to be, affected with that inflammation, are tortured with frequent cramps and startings, so as often to raise and violently shake the limb.

These spasmodic startings, or twitchings, are often much increased by purgatives; nay, in a gentleman very subject to them, after they had ceased for several

hours, during constipation, an opening medicine, which eventually operated thrice, renewed the twitchings a full hour before an actual evacuation occurred.

I have already mentioned the heat of the head, and redness of the face and eyes, which often attend the whole train of nervous disorders, apoplexy, &c.

In a lady, depression of spirits was always proportioned to the degree of burning heat, and sensation of bursting, which occupied the head, face, eyes, mouth, tongue, throat, chest, and stomach. The extremities were generally cold, the pulse in the radial arteries was always weak; in the carotids always too strong.

So it is well known that persons, troubled with permanent heat, and eruptions, of the face, are particularly liable to violent nervous complaints and even mania.

In a gentleman, suffering pain on one side of the head, and the eye on the same side only, the pulsation of that carotid alone was preternaturally strong; and the opposite side of the body was affected with hemiplegia.

I have already remarked the increased vascularity of the skin in the neighbourhood of the testes in sheep, at the time of rutting.

The approach of gout in the extremities is in some persons often announced by sciatica.

In others, previously to the fit in the feet, corns, before not felt, become painful; and subcutaneous glands about the shin swell, and become sore.

In a gentleman, whenever inflammation, usually ending in suppuration, seized a lymphatic gland about the neck, and sometimes merely under the point of the chin, he became extremely deaf, and his head was affected with pain, almost constant vertigo, and loud and distressing noises.

Of young children, I have seen one, in whom dentition was attended with epilepsy, and another, in whom it was followed by hemiplegia.

Even the increased determination of blood to vessels, which undergo natural and salutary discharges, will sometimes extend itself to other branches of the same vessels. Thus, it is not uncommon for females to suffer diarrhœa previously to each menstrual period; and sometimes that discharge will wholly supersede the menstrual evacuation.

These facts will suffice, as examples of the concurrence of affections, various as to their seat and apparent quality, from one common and simultaneous condition in different branches of the same arterial trunk.

(DCCCLIX.)

A second variety, under this head, is the mere successive extension of similar affections, though, perhaps, under different names, to immediately contiguous parts.

Thus erysipelatous inflammation of the skin will often affect the cellular substance underneath, in form of common suppurative inflammation.

So from the ulceration of the skin of the heads of poor children, produced by scratching in order to relieve the itching from lice, inflammation extends along the lymphatics, giving occasion to what are usually called scrophulous swellings of the different glands in the neck.

A similar effect is very commonly produced, in the same manner, by the application of leeches or blisters to the temples or head; and so in other glands, according to the part, from like causes.

(DCCCLX.)

Under the second head, or that of morbid states, which, having affected one part at one time, are apt, in the same person, to affect another part, in a new form, at a subsequent or somewhat distant time, I may adduce the following cases.

The examples are very common, in which the same patients, at different periods, shall have hæmorrhoids, headach, vertigo, erysipelas, or gout.

Frequently, also, a constitutional disposition to one or more of these affections will end in epilepsy, hemiplegia, or apoplexy.

In one patient, the succession, at somewhat remote periods, was gout, mania, and, at last, fatal epilepsy.

In another, gout, epilepsy, and long continued mania.

In several instances I have seen fits of epilepsy, wholly superseded by those of gout.

In another case, the succession was epilepsy, gout, and fatal asthma.

In a gentleman, who was for many years a very intemperate liver, gout, to which he was long subject, entirely ceased after a glandular abscess in the neck, followed by a great discharge.

A gentleman, when a boy, was subject to violent earachs, ending in suppuration. About this time he had a typhus fever, which seemed to terminate by a very profuse hæmorrhage from the nose. Some years after, the earachs having entirely ceased, he had a synocha; and, in the course of a few years, a rheumatic fever. Somewhat before the latter period, he became very dyspeptic, and was liable, from that cause, to frequent headachs. He next had what appeared to be inflammation in the villous coat of the colon; which was repeated, seven years after. He now began to have occasional fits of the gout; and then, renal calculi. These disorders were followed by what seemed to be accidental erysipelas of the face, which was immediately succeeded by a very severe fit of the gout.

A gentleman, long subject to gout, which had disappeared, and was followed by cough, difficulty of breathing, anasarca of the lower extremities, and defective urine, was cured. But now another disorder appeared. He was suddenly seized with a loss of sense, though without either convulsions, or hemiplegia. He recovered; but then became affected with aphthæ all over his mouth and throat. No sooner was he restored from this malady, than he was seized with a smart fit of the gout, which went through its usual forms in the most favourable manner.

Another patient, under a similar state of what is called atonic gout, with a quick pulse, defective, high-coloured urine, legs and thighs enormously swelled, and such a difficulty of breathing, apparently from hydrothorax, that for forty nights he had not even attempted to go into a bed, in a few days, in consequence of certain appropriate measures, lost every symptom of disease. And now there came on a spontaneous and acute fit of the gout, from which he soon recovered perfect health.

A lady, habitually subject to diarrhœa, during which she enjoyed good health, fell into the opposite state, that of costiveness. Some months afterwards, she was suddenly seized with giddiness and headach, accompanied with fever, and followed by an almost apoplectic insensibility, great heat of her head and face, and other symptoms of erysipelas. This disappeared after three or four days; and she returned to her former state of costiveness. Five months after, a pain in the head, and giddiness, with an effort towards erysipelas on the left side of the face, again occurred; the latter, however, ineffectually. And now, by degrees, there came on hemiplegia on the right side, together with loss of speech. In this case, then, there was not only the alternation, with diarrhœa, of excessive determination to the vessels of the head, but amidst the general increased impulse on the left side, that in the internal carotid predominated over that in the external, producing extravasation on that side, and consequent hemiplegia on the opposite.

A gentleman had, during one spring, great

depression of spirits. The next year, at the same season, a very large part of the cuticle was in a state of desquamation from extravasated serum, and his spirits were perfectly good.

Two patients, accustomed to regular fits of gout in the spring and autumn, missed their spring fit, and had each hemiplegia on the left side. One of them, also, missed his autumnal fit, became apoplectic and hemiplegic on the right side, and died. The other had two or three slight fits of the gout, accompanied with fever; but having remained free from it at its usual period the next spring, was seized with hemiplegia on the right side.

In some persons, accustomed to gout in the extremities, anasarca alone has occasionally occurred, in a succession of symptoms otherwise similar to that accompanying the former disease; and, after a short time, has receded, like gout itself.

(DCCCLX*.)

The third head of variations of disease constitutes that class, to which we may strictly confine the term Conversions; signifying by it those cases only, in which a disorder wholly or nearly leaves one part or texture, and the patient is immediately seized with a malady in some other part or texture. Examples of this kind are common, and give very important information as to the nature and cause of diseases. The following are such as have occurred to my own observation.

In a gentleman, the pain of a node on the shin,

supposed to be venereal, alternated with vertigo, and a sense of numbness in the head.

A headach of some years duration, subsiding, was followed by a cough, accompanied with incessant and wasting hectic fever. After the man had long been confined to his bed, and death was every day expected, the headach began slightly to return; and, as it became established, the cough and fever receded, and the patient regained his flesh, but continued subject to headach as before.

In a gentleman, who had long laboured under vertiginous and other distressing complaints of the head, with inflamed blood, inflammation of the heart more than once occurred, suspending the former symptoms; which immediately returned as the carditis abated.

Similar complaints in the head, with great bodily weakness, in a young lady, were wholly removed by peripneumony, or by its remedies.

The lady, whose case has been above alluded to,* and who had long suffered all the changes of nervous affection, was seized with vomitings, which continued almost constantly, after every species of food, for more than a year, with great relief to all the symptoms. The vomiting being within that period thrice for a short time cured, the disease returned with its former violence; but was always again relieved, when the vomiting was renewed.

Certain persons, labouring under similar complaints, experience immediate relief on the coming on

* Page 240.

of vernal eysipelas; and others on the appearance of other eruptions.

The same diseases occasionally, though rarely, end in a long and copious ptyalism.

They, also, sometimes cease, on the appearance of arthritic inflammation.

In females I have not unfrequently seen headach, and spasmodic difficulty of breathing, cease on the supervention of aching pains in the lower extremities, and of that peculiar sensation in them, which is called Fidgets.

In a lady, who had slight paralysis of the hands, and pain and other morbid affections of the head, those circumstances were always much relieved by the accession of spasmodic asthma; and regained their usual force, when the asthmatic fit subsided.

In another lady, vertiginous affections alternated with painful, but transitory, swellings of the mammæ.

Various nervous symptoms, in a third, disappeared on the commencement and gradual increase of a vascular fulness of one mamma, accompanied, probably, by extravasation of blood. The progress of this symptom was suspended by rheumatism in the hip; which disappearing, the affection of the breast rapidly increased.

The alternation of vertigo with hæmorrhoidal discharge is an extremely common occurrence.

In a gentleman, long accustomed to violent vertigo, or pain in the head, these affections were constantly relieved on the coming on of œdematous swellings, without inflammation, in the legs and feet.

In another, an eruption of red papulæ always alternated with sickness and vertigo.

In a lady, mania, which ended in suicide, alternated with œdematous swelling of the ankles.

Fits of spasmodic asthma are not uncommon after the cessation of gouty paroxysms.

A gentleman, formerly affected with frequent fits of epilepsy, ceased to suffer them on the appearance of gout, which often recurred, and a paroxysm of which was immediately followed by a sudden attack of spasmodic asthma, which, in twenty minutes, proved fatal.

On the other hand, various diseases of the head, as headach, vertigo, depression of spirits, mania, epilepsy, and apoplexy, in many instances, either immediately or soon, succeed the recession of inflammatory gout from the extremities.

In a clergyman, slight gout receded, and was followed by a small discharge of blood from the rectum; which, ceasing, was soon succeeded by fatal epilepsy.

In a gentleman, epileptic fits which used to occur at least once a week, were suspended for three weeks by pneumonia; but returned with additional frequency after the pneumonia had ceased.

In a lady, a violent coryza, of four days standing, was immediately removed by an epileptic fit.

Another, on the going off of fluor albus, under which she had long suffered, was immediately seized with pain and weight in her head.

I have known vomiting of blood, and mania, occur alternately in a female patient, during the same illness.

Bronchocele, in a lady, gradually disappeared during the progress of a fatal inflammation of the liver.

The disappearance of cynanche parotidæa (mumps) has been stated by authors as having been often followed by a painful swelling of the mammæ in females, and of the testes in males. I have seen only the latter modification, attended with an obstinate suppression of urine, which long required the use of the catheter.

As catarrhs recede, they are frequently succeeded by breakings out on the lips, or lower part of the nose.

A gentleman had inflammation of the mucous membrane of the trachea, with fever. The local inflammation ceasing, was followed by slight inflammatory affection of various joints; on the cessation of which, various glands became swelled and painful. This patient recovered; and in about two years after, had decided gout in the lower extremities.

I have seen, in a young man, long continued cough, accompanied with fever, night sweats, and emaciation, cease on the spontaneous occurrence of inflammation and ulceration under the scapula.

A gentleman was for many years afflicted with constant difficulty of breathing and cough. A long and unusually violent aggravation of this malady was followed by œdematous swelling of the lower extremities, which at last ascended to the scrotum; and was attended with defective and high-coloured urine. As this swelling increased, the orthopnœa gradually subsided, and at length wholly vanished. After some weeks, the secretion of urine by degrees returned to

the natural state, and the swelling proportionably decreased. When it was entirely gone, the difficulty of breathing in some degree reappeared, but, after a short time, again vanished. And now mental alienation gradually succeeded, but after some months, gave place to a return of asthma, which continued till he died. During each stage of this succession, there was fever; and blood, drawn from the arm, exhibited the appearance common to acute inflammation.

The alternation of cutaneous eruptions with different forms of dyspepsia is common and well known.

That of the same disorders with asthma, and other forms of difficulty of breathing, has, in my experience, been, to the full, as frequent, and much more important.

I have often seen various thoracic affections, as pulmonary consumption, asthma, inflammation of the heart, or hydrothorax, arise from the spontaneous or artificial cure of ulcers, perpetual blisters, or fistulæ.

Rheumatism often alternates with cutaneous eruptions; and, therefore, in such cases, formerly obtained the name of scorbutic rheumatism.

Gout frequently succeeds the recession of erysipelas, and *vice versa*.

I have known an instance, in which long continued symptoms, apparently of pulmonary hectic, were entirely removed by a frequent and copious hæmorrhage from the nose; which last disease itself proved ultimately fatal.

In a man affected with cough, and bloody expectoration, the last wholly ceased, and the former nearly,

when œdema of the lower extremities took place; but returned in a fatal degree, when the œdema vanished.

I have already mentioned instances, in which the most extensive œdema ceased from violent spontaneous hæmorrhage.

That kind of chronic bronchitis, which is often called asthma humidum, is frequently relieved by the coming on of œdema in the lower extremities.

I have also known dyspnœa and cough, of long standing, entirely cease on the appearance of ascites.

A gentleman spit blood copiously almost every day for twenty years; during which he abstained from animal food, and every form of alcohol. Having attempted to return, by slow degrees, to the use of the former, he had, in one year, four attacks of inflammatory fever. These were succeeded by vehement palpitation of the heart, which frequently returned during several years. They ceased on the supervention of cough, with very copious and constant expectoration of thick mucus, unaccompanied with blood. By degrees, and after some years, the cough and expectoration disappeared; and he had then dyspepsia and occasional attacks of palpitation; both of which seemed to give way to remedies, but were immediately followed by hæmoptöe. From this period, during all his remaining life, which was extended to more than eighty years, the three states of mucous expectoration, hæmoptöe, and palpitation, alternated with each other; but no two of them existed together.

In a gentleman, habitual cough, dyspnœa, expectoration, and deafness, were nearly cured by hemiplegia, and returned as the hemiplegia was relieved.

In a lady, habitual cough and expectoration were for many days suspended, during the continuance of a violent rheumatic pain on one side of the head, accompanied with fever; but recurred, when the two latter had ceased.

Two instances have occurred to me, in which, on the cessation of pleurisy, the patient was immediately seized with peritonitis.

In several others, pleurisy gave way to immediate and fatal diseases of the head; of which one case was proved, by the dissection, to have arisen from inflammation and albuminous effusion above the pia mater.

A lady, affected with habitual cough, straitness of breathing, feverishness, and great expectoration, had all these complaints suspended for several days by cholera.

A gentleman was for many years so harassed by difficulty of breathing, cough, and copious expectoration, that he was obliged to sit up during the greatest part of the night. On his being seized with a very painful erythema on the scalp, followed by deep sloughs, and accompanied with fever, the pulmonary symptoms entirely ceased. As these sloughs grew well, mania supervened; but, after a short time, was cured by low diet and depletion. Then, none of the former complaints returned.

I have seen hæmorrhage from the kidnies immediately succeed the desquamation of the measles.

The disappearance of the scarlatina is often followed by the succession of more, or fewer, of the following symptoms; bloody urine, arthritis, œdema of the extremities, ascites. To which may be added, in one instance which I have seen, convulsions, and, in another, epilepsy.

A lady, who for several years had itching and smarting of the anus, attended with slight serous or mucous discharge, began to perceive some diminution of the symptoms, and, at length, experienced an almost total exemption from them; when she immediately became affected with a violent catarrhal disorder of the nose and throat, so as to become unable to breathe through her nostrils. It generally extended itself to the Eustachian tube, and, when worst, to the bronchia, producing great stricture, though without cough. These symptoms continued long, and, on their removal, the affection of the anus returned.

In a gentleman, the temporary cessation of the discharge of a somewhat bloody humour from the rectum, was always followed by inflammation of the eyes.

A gentleman, who had long laboured under vomiting, was no sooner cured of it, than he became anasarcous. A spontaneous purging coming on, the anasarca disappeared.

Ascites also has, in my knowledge, yielded to violent spontaneous diarrhœa.

In a youth, hæmorrhage from the bowels gave place to rheumatic inflammation of the lower extremities; and that to petechial spots and œdema.

In an adult male, similar spots on all the extremities alternated with œdema of the feet and legs.

The heat and discharge attending a slough in one of the legs of a female patient, always ceased, when convulsions came on.

I have seen a lumbago, of several weeks duration, entirely cease, while the patient had violent inflammation of the eyes and face; and return in a few days after that inflammation had subsided.

In a man, habitual inflammatory swellings of the joints were always carried off by attacks of the slight West-India fevers, and returned as the fever abated.

A gentleman, accustomed for twenty years to periodical hæmorrhoids, six weeks after they had been absent, was seized with slight rheumatic fever, in which the parts affected were the shoulders, back, loins, and knees. This continued for nearly four months, when there occurred some return of hæmorrhoidal discharge, with an aggravation of fever. The rheumatic pains now diminished, and, at the end of eight or nine days, the discharge from the hæmorrhoids being re-established, were nearly gone.

Hæmorrhoidal swellings, with discharge, having in a male patient continued for three weeks, at length wholly disappeared; three hours after which, the gout supervened in one extremity.

A gentleman had the following succession of maladies; gout, often alternating with enteritis, followed by apoplexy and hemiplegia. The latter complaints were relieved. Then occurred enteritis, and, in its place, an almost total want of the secretion of urine,

without fever. This last symptom was succeeded by gout, which gave place to fever, attended with marks of erysipelatous inflammation of the stomach, and fatal sanguineous vomiting, during which the urine was restored to its natural colour and quantity.

A girl, aged eight, had long a mucous discharge from the vagina. This ceased, and the eyelids became inflamed. The latter malady disappearing, the former returned.

(DCCCLXI.)

In all these instances, which have been derived solely from my own observation, and to which many others might be added from medical writings, the several forms of disorder appear to be vicarious affections, consisting of different modifications of one common action, directed, from unknown and spontaneous causes, to different parts.

(DCCCLXI.*)

To these, however, may be added many others, in which conversions are the effects of accidents, or of artificial means, acting either by producing disease on the constitution, or on the part on which they act; and thus relieving prior morbid affections; or the converse.

(DCCCLXII.)

The following are examples of changes of the first kind:

Headach, depression of spirits, and other nervous

affections, with which a young lady had long been afflicted, were completely cured by the measles.

In a gentleman labouring under gout, the fit was immediately removed by an accidental catarrh from cold.

In a boy, a fit of spasmodic asthma was suspended by a violent concussion of the brain, and returned as soon as the immediate effects of the concussion had ceased.

A gentleman, who had suffered many attacks of pain during the passage of gall-stones, had gout in his great toe. This was immediately removed by a fit of gall-stone, attended with the usual symptoms. No sooner, however, was the pain relieved by opium, than the gout returned to his foot.

The disposition to gout is, also, often suspended by the effort to eject renal calculi through the ureters.

In a lady, true chronic rheumatism in the right shoulder was immediately and permanently relieved on the appearance of jaundice, with pain, from a gall-stone, which did not pass.

I may here, also, mention the case of a lady, who for many years had been afflicted with a cough and difficulty of breathing, and who was immediately and permanently cured by a large hæmorrhage from the humeral artery, produced by the extended ulceration of an issue made many years before on the inside of the arm.

(DCCCLXIII.)

The instances, which follow, are the converse of

the former; or those of new maladies, occurring on the artificial removal of those previously existing.

In a gouty patient, involuntary twitchings of the hands were relieved by dipping them in cold water; immediately after which, there came on a flushing of the face, with a stuffing of the nose, and other symptoms of coryza.

An old man, who had lived freely, had a chronic inflammation of one leg, accompanied with œdema. Both were greatly relieved by the application of a tight bandage. In a few days he was, for the first time, seized with violent epilepsy.

A young lady, long labouring under chlorosis, had very extensive œdematous swellings in her lower limbs, with little or no disorder of her head. The swellings were removed by bandages, and other remedies; immediately after which, she became affected with a violent pain on the right side of her head, which was always much relieved by a flow of tears, which took place from that eye only.

A woman, long affected with an ulcer in the leg, was cured, and immediately seized with sickness and vomiting, which continued for several weeks. A blister, applied to the epigastrium, discharged most copiously; and in forty-eight hours the vomiting ceased.

A girl, seventeen years old, had a chronic ulceration of the foot. No sooner was this cured, than she was seized with a disease of the heart, accompanied with great enlargement, which proved fatal.

In a lady, the colica pictonum, and the subsequent palsy of the hands, arising without any evidence of

the agency of lead, were cured by the Bath waters. Four years and a half afterwards, she had sciatica for five months. Friction of the part with opodeldoch immediately relieved the pain, but, a few hours afterwards, was followed by a return of the colic, succeeded by palsy of the hands as before.

A gentleman had habitual excessive sweating, which was cured. Immediately he became affected with hydrothorax, anasarca, and ascites; all of which were, however, happily removed by digitalis.

An athletic man, accustomed to strong but irregular exercise, subject to sciatica, and who, some years before, had suffered a fit of the gout, strained his instep; some days after which, he had the part pumped on with cold water. The pain was immeately relieved; but in five minutes he was seized with excruciating pain up the leg and thigh, together with a sense of violent constriction round the thorax and head.

In two cases which occurred between twenty and thirty years ago, immersion of a gouty foot in cold water, which produced instant relief of the pain, and a proportional abatement of the inflammation, was in a few hours followed by hemiplegia.

A young man had, all over his ankles, boils, which were very painful and troublesome to him, in an occupation which required much walking. They continued for some days; and after the legs and feet had been bathed in tepid water, had, conjoined with them, œdematous swellings of the ankles. The parts were now, during one evening, kept wet with camphorated

spirits, which relieved the pain and reduced the swelling. On the same night he was seized with constriction round the chest, so violent as to threaten suffocation. This continued several hours.

A man, long affected with psoriasis, had tried for several months all the remedies which could be devised, but ineffectually. The liquor arsenicalis in a few days cured the eruption, but immediately produced ascites, with paucity of urine. These complaints were removed by the squill; but the eruption then returned. The same processes were twice repeated, with precisely the same effects.

Other examples of the production of new diseases from the cure of old ones have been already adduced.*

To these, perhaps, may be added, the hydrothorax, and other affections of the lungs and stomach, which often follow the removal of scirrhi from the mammæ.

In a lady, who was troubled with burning heat of her feet, and fidgets in the legs, pleurisy was brought on by removing these symptoms by walking, though otherwise dressed, with her naked feet on a cold floor.

(DCCCLXIV.)

It will have been observed, that the changes, above related, include the following maladies; which, exclusively of those arising from the influence of mechanical causes, or of infectious or other miasmata, are the principal to which the animal frame is liable.

First, excessive determination or momentum of blood to the skin.

* Page 311, &c.

Sweating, scarlatina, measles, erythema, erysipelas, and all the forms of eruptive diseases.

Secondly, to mucous membranes.

Coryza, catarrh, whooping cough, croup, sore-throat, peripneumonia notha, catarrhus senilis, bronchitis, asthma; aphthæ, dyspepsia, diarrhœa; and various other disorders of the villous coat of the alimentary canal; strictures in the urethra, œsophagus, colon, and rectum; gleet; fluor albus; catarrhus vesicæ.

Thirdly, to serous membranes.

Phlegmon; pleurisy; pericarditis; peritonitis of different parts, constituting enteritis, puerperal fever, &c.; inflammation of the tunica vaginalis testis.—To synovial membranes, producing arthritis; together with the effects of these several states, anasarca, hydrothorax, hydropericardium, ascites, hydrocele, effusions into joints, adhesion, anchylosis, &c. &c.

Fourthly, to various other membranes.

Of the spinal marrow or nerves, paraplegia, sciatica, tic douloureux, &c.—To the epithelion, deafness.

Fifthly, to glandular parts.

Cynanche parotidæa, or mumps; swelling and other disorders of the thyroid gland, mammæ, testicles, prostate, and various other glandular parts; phthisis pulmonalis; atrophy.

Sixthly, to the head.

Headach, vertigo, sleeplessness, common nervous affections, mania, delirium, convulsions, hysteria, epilepsy, catalepsy, inflammation of the pia mater or arachnoides; together with their occasional sequelæ,

hemiplegia, apoplexy, hydrocephalus, and other effusions.

Seventhly, to other parts in various forms.

Peripneumony, enlargement of the heart, liver, spleen, kidnies, testicles, and uterus, with or without inflammation; fungus hœmatodes, ophthalmia, cataract, amaurosis.

Eighthly, various increased natural discharges, not already specified.

Ptyalism, diabetes, lacrymatio.

Ninthly, morbid depositions, not above arranged.

Scirrhosities, indurations, ossifications, chalk stone, biliary and renal calculi, and other hard deposits in different parts.

Tenthly, hæmorrhages.

From serous, mucous, or other membranes, or parenchyma; as from the nose, uvula, fauces, lungs, stomach, intestines, kidnies, bladder, uterus, vasa deferentia, skin, liver, &c. To which may be added, the various forms of purpura.

(DCCCLXV.)

Such are the chief examples, which occur to me, of diseases, in which increased impetus, momentum, or determination of blood, forms one essential link in the series of previous phænomena or causes.

(DCCCLXVI.)

In what particular cases they depend merely on excessive local momentum, and in what there is the coincidence of increased action of the heart, it may

be difficult, in every instance, accurately to decide. The same symptoms may arise under both states; but, as inflammation, hæmorrhage, and dropsy, may occur without excessive action of the heart, and yet usually exist in the greatest degree, when that action is greatest; so, probably, cæteris paribus, the same may be asserted under the condition of increased local impetus, without inflammation. Farther light will be thrown on this part of the subject, when we come to the more particular consideration of the phænomena of the several diseases arising from this general cause.

DEFECTIVE DETERMINATION OF BLOOD.

(DCCCLXVII.)

HAVING thus given a view, as concise as the nature of the subject will admit, of the various modifications of disease, which are derived from increased afflux, momentum, or determination of blood to the several parts of the animal frame ; I might, perhaps, be expected to advert to those disorders, which arise from an opposite state, or the want of sufficient impulse or supply of that fluid. Since, however, neither this work, nor that, of which it is the outline, is intended as a complete system of animal pathology, or of all diseases to which the frame is liable ; so it may be sufficient for me merely to particularize a few of the more conspicuous of those states, in which the want of a due determination of blood extends within the limits of disease.

(DCCCLXVIII.)

The defect of circulation in one part, which often attends excessive determination to other parts, has

already been slightly noticed, and will meet with more particular consideration hereafter, under the view of a series of phænomena, of which it forms an important link.

(DCCCLXIX.)

Since the blood is the material of growth and secretion, we may conceive the greater number of those cases, in which, with a due degree of general nutrition, there is a deficiency in either of those respects, to originate in the want of a proper degree of afflux to the several parts suffering under that defect.

(DCCCLXX.)

To this cause may be attributed that shrinking of muscular parts, which follows their long disuse, whether from indolence or disease. Of this kind is that extenuation and flaccidity of the muscular substance of the heart, which is observable on dissection, whether from unknown causes, or from obstruction in the coronary arteries; and which frequently produces sudden death.

(DCCCLXXI.)

To the same head may be referred the singular case of the sinking in of one eye, and a change of colour from dark brown to white of the hair on half the head on the same side, in a young female, from hemiplegia; and the general greyness of the hair, which took place in another female, during the course of only six weeks, from severe affliction.

(DCCCLXXII.)

The sudden and entire failure of pulse in one artery, as for example of the humeral and its branches, while the action of the heart, and the pulse in other arteries, are perfect and strong, is considered as a rare occurrence. Three instances of this kind have occurred in my practice.

(DCCCLXXIII.)

Under this head may be specified defective menstruation; a frequent, yet not constant, concomitant of chlorosis, but often occurring without any other apparent indisposition. Such a state I have seen in a married woman in perfect health, and possessing, to all appearance, every sexual distinction, who nevertheless had in vain looked for this change to her twenty-sixth year. Since the facts, already stated, shew the probability of an increased vascular fulness and volume of the uterus at the periods of menstruation, so analogy, and some other circumstances, lead me to conclude, that a defect of vascular fulness, and a shrinking of the uterus, occur in certain cases of amenorrhœa.

(DCCCLXXIV.)

From a similar analogy it is highly probable, that costiveness, arising from want of the due peristaltic motion of the alimentary canal, is dependent on the defect of a proper momentum of blood in the arterial system of that part. In favour of this conclusion, there is the direct evidence of the effect of compres-

sion of the carotid arteries, in relieving headach and flushing of the cheeks, increasing the warmth of the lower extremities, and, at the same time, producing a glow in the stomach and bowels, and a sensible propulsion forwards of the contents of the intestinal tube.

(DCCCLXXV.)

In cases in which large arteries have either been tied, or have spontaneously coalesced, not only mortification occasionally follows, but a disposition to ulceration in the extremities so deprived of their due supply of blood. The latter fact is worthy of particular observation, as it shews, that, whether the imperfect life of a part be the consequence of excessive or defective momentum of blood, the lymphatics begin a like process of removing, by absorption, the extraneous part.

(DCCCLXXVI.)

Of all the examples, however, of deficient circulation, the most conspicuous is that, in which, either from hæmorrhage, or various other causes, an inadequate quantity of blood flows to the brain, producing syncope, or immediate death.

(DCCCLXXVII.)

Less quickly, but often not less certainly, fatal, is that gradual process of hæmorrhage, which occasionally takes place from the nose, the stomach, the hæmorrhoidal or uterine vessels; from which a tendency to syncope occurs on the least exertion, and the

patient dies with an accumulation of blood about the heart and lungs.

(DCCCLXXVIII.)

Such also, but still slower in its progress, is the state of atrophy without fever, which is sometimes, though rarely, seen. Since, however, this disease probably arises from induration of the mesenteric glands, increased momentum forms one link in the chain of its causes.

(DCCCLXXIX.)

These are all the cases of disease, whether topical or general, arising from defective determination or supply of blood, that I think it necessary to particularize here.

EXEMPLIFICATIONS OF SALUTARY PROCESSES.

(DCCCLXXX.)

IN former parts of this work, evidence has been adduced of the disposition of the constitution, in various ways, to relieve itself by general or topical processes of evacuation and reduction.

(DCCCLXXXI.)

Some notice, also, has been taken of that power in the animal frame, which it has been usual to designate by the term Reaction. The more particular consideration of this state, and the attempt to shew in what respects it agrees with, or differs from, the former, were more particularly reserved to this place.

(DCCCLXXXII.)

This power of reaction most obviously shews itself in that unusual redness, and glow of warmth, which are perceived in any part, as the hands, after they have been preternaturally cooled; and which evi-

dently arise from an increased determination of blood to the part, succeeding a deficient afflux of that fluid.

(DCCCLXXXIII.)

During youth and strong health, this increased flow of blood follows the impression of cold so quickly and permanently, that neither uneasiness, nor any other disorder, supervenes. We see this state in the cheeks of young persons of both sexes, and in the red arms and elbows of servant maids, exposed to the action of cold, moisture, and the severest frost, without any consequent suffering.

(DCCCLXXXIV.)

When this reaction, however, proceeds a certain degree beyond that which is necessary for the well-being of the part, with regard to sensation and other functions, some morbid affection follows.

(DCCCLXXXV.)

This morbid affection is usually Inflammation; which has different names, according to the texture and previous circumstances of the part, or the degree of the malady. Such are the various inflammatory affections of mucous or serous membranes, skin, ligament, &c. before particularized.

(DCCCLXXXVI.)

There is no disease, in which the process of reaction is more apparent, than in the common fit of ague; in which, after a considerable degree of cold-

ness and bloodlessness of the skin and extremities, a violent determination of blood takes place to the parts previously chilled, excessive heat, redness, and fulness succeed, and the fit is terminated by a copious evacuation of sweat.

(DCCCLXXXVII.)

In this process, one of the most conspicuous circumstances is the occurrence of the shivering; the nature and final cause of which demand a more particular investigation.

(DCCCLXXXVIII.)

This shivering consists in short, quick, and frequently repeated convulsions of various muscles; and since experience shews that the degree of the hot fit very much depends on the violence, and, within certain limits, the duration, of this shivering, we cannot avoid concluding, that there is some connection between the two, in the relation of cause and effect.

(DCCCLXXXIX.)

If we investigate the causes, which tend to accelerate the circulation of the blood, we shall find that muscular exertion is very powerful for this purpose. By it the heart is evidently stimulated to increased action.

(DCCCXC.)

Since, also, the respiration bears a very uniform relation to the systoles of the ventricles of the heart,

the latter being to the former in the proportion of about four to one, it is evident, that the number of respirations in a given time must also be, by the same cause, increased; whence it is probable, that an unusual quantity of heat will be fixed by the lungs, and afterwards evolved or secreted in the course of the circulation.

(DCCCXCI.)

Shivering is, therefore, a modification of exercise, often intended to restore circulation and heat to parts, in which both were before defective.

(DCCCXCI*.)

When the same phænomenon precedes suppuration, its purpose is little different; since, probably, it serves merely to effect the effusion of pus already formed in the extreme vessels of the inflamed part.

(DCCCXCII.)

In cases of gall-stone, shivering seems to answer the end of other modes of exercise; that of assisting in the propulsion of the extraneous substance.

(DCCCXCII*.)

Of muscular motions, either automatic or voluntary, intended probably for the same purpose of carrying on preternaturally retarded circulation, or otherwise restoring its balance, we may specify many other examples in the animal œconomy.

(DCCCXCIII.)

Thus I have known violent shivering or tremors of the whole body, unaccompanied with coldness, or succeeded by preternatural heat, in a short time relieve a very acute gouty pain in the upper part of the instep.

(DCCCXCIV.)

Convulsions themselves are only another modification, and perhaps a greater degree, of the former state of tremor. These usually occur in epilepsy and hysteria. Many instances have occurred, of patients accustomed to the former disease, accompanied with strong convulsions, who, in the intervals, have enjoyed tolerable health. At length, another form of cerebral malady has taken place. The patient has lain several days in a lethargic state, with contracted pupils, and no mark whatever of compression of the brain; and at last has died without any, or with only a slight degree of, convulsion. A similar fatal malady has affected other patients, who had never before suffered cerebral disease.

(DCCCXCV.)

On the other hand, in a young lady long afflicted with headach, vertigo, and vomiting, which at length ended in total blindness, so as to induce a belief that she laboured under hydrocephalus internus, all the symptoms were in a few hours removed by a violent fit of convulsions.

(DCCCXCVI.)

From these circumstances it is probable, that such convulsions are a salutary process; tending, like muscular exercise, to restore the balance of circulation, and thus to relieve excessive and predominant determination of blood to the brain.

(DCCCXCVII.)

With regard to hysteria, as the termination of its paroxysms is rarely, if ever, fatal, we are not well able to try the advantage of convulsions in it by a similar test; but since, conformably to the facts stated above, (DCCL.) hysteria differs from epilepsy, chiefly in the degree of suffering in the part affected, we may justly conclude, that a similar process obtains, for similar purposes, in both.

(DCCCXCVIII.)

It is even a strong confirmation of this inference, that, both in hysteria and other common nervous affections, the convulsions are infinitely more violent, and therefore alarming to the spectators, than those of epilepsy; whence we may conclude, either that the brain is less oppressed by the cause producing them in the former cases, or else that their greater violence actually overcomes the fatal tendency of the disease.

(DCCCXCIX.)

It is still farther in proof of this principle, that in hysteria, and even in epilepsy when slight, the attacks

occasionally begin, and sometimes terminate, with screaming and other voluntary muscular exertions.

(DCCCC.)

In hysteria, also, there are frequently other actions, which, though of muscles often obeying volition, are, in this case, automatic; such as those of laughing and crying.

(DCCCCI.)

So, under various modifications of nervous diseases, the patient shall sometimes have vehement fits of spasmodic coughing, and, at other times, frequent vomitings.

(DCCCCII.)

It seems to me, that, in all these cases, one purpose of these several motions is to drive forwards the blood in the veins, and thus to promote a free and equable circulation of that fluid throughout the system.

(DCCCCIII.)

This effect exactly accords with that of uniform voluntary exercise of the body, by means of its own muscles, in walking, swinging weights, pugilism, the manual exercise with a firelock, &c. &c.; which will be uniformly found to be the best preventive of all the diseases depending on excessive sanguineous determination, and, when properly adjusted, an essential part of the cure of the far greater number of them.

(DCCCCIV.)

It is easy to see how different the operation of this cause is from that of heat, wine, full meals, certain passions, and various other stimulants; for while these, for the most part, cause the heart to produce an inordinate momentum of blood in the several branches of the arterial system, and more especially of the head, while the venous system is only secondarily and imperfectly acted on, bodily exercise, on the contrary, urging forwards the blood in the veins, admits of a ready evacuation of arterial blood into those channels; just as opening a vein produces a quicker determination of blood from the neighbouring vessels to the wounded part.

(DCCCCV.)

Whether the explanation, which has thus been offered, respecting this difference, be true, or not, is of little consequence. The fact is incontrovertible; and affords a strong analogy as to the effects of automatic and other muscular motions in diseases of irregular sanguineous determination.

(DCCCCVI.)

Tendencies of the same kind occur in insanity, and other modifications of mental aberration.

(DCCCCVII.)

Under impressions of sorrow, suspense, &c. not only is the patient relieved by tears, which unload certain branches of the carotid artery, but consider-

able mental ease is obtained by that species of deep inspiration, called Sighing; by which the right auricle, and therefore the jugular veins and the whole venous system of the brain, are in an unusual degree emptied of their blood.

(DCCCCVIII.)

It is not improbable, that a final cause of the deep inspirations in apoplexy and epilepsy, and in the states which often precede, or follow, those diseases, may be this evacuation of the venous system of the brain.

(DCCCCIX.)

Among the automatic efforts to restore circulation, we may, perhaps, class the convulsions, which sometimes accompany recovery from syncope, and the last moments of life in animals dying of hæmorrhage.

(DCCCCX.)

By what catenation such salutary efforts are excited in the system, I am wholly unable to explain. The facts themselves are offered merely as suggestions, for the purpose of inducing attention to certain movements in the animal œconomy, which, from their frequency, are regarded as unimportant and uninteresting.

(DCCCCXI.)

Another case, which excellently exemplifies the process of reaction, is that of gout.

(DCCCCXII.)

I have already considered this malady in one light, which is that of evacuating and depleting the system; but we may here advert to it as one of the most powerful means of restoring the due balance of circulation, or, at least, of changing the direction of excessive momentum of blood.

(DCCCCXIII.)

With regard to the first of these views, I have endeavoured to shew, that a certain degree of plethora is incompatible with the healthy state of the constitution; and that the degree, necessary or conducive to the production of what is called disease, varies, according to the constitution of the several patients, and even of the same patient at different times.

(DCCCCXIV.)

I have also suggested, that while indolence, and habitual indulgence of present desires, are the causes which usually dispose the body to fall into disease, from such a degree of plethora, as under other circumstances, would be insufficient to produce that effect, these two habits, growing too much out of the modes of civilized society, are apt, also, to produce the concurrence of plethora itself.

(DCCCCXV.)

This combination of circumstances either actually produces disease, or else renders the body more liable to be affected by it from the coincidence of other

causes, which may be considered as exciting or occasional.

(DCCCCXVI.)

The diseases, thus produced, are evidently those of irregular determination of blood, as above explained.

(DCCCCXVII.)

The particular diseases, which are most apt to occur from the operation of the primary causes, (DCLXXX.) without the concurrence of any observable specific causes of excitement, are, especially, those of the head and alimentary canal.

(DCCCCXVIII.)

These two maladies are often totally independent of each other; so that various determinations of blood to the head, usually called nervous, occur in thousands of instances, in which all the phænomena, constituting the digestive functions, are perceived to be in their just degree and order; and, on the other hand, various forms of dyspepsia often exist, without the least disorder whatever of the head.

(DCCCCXIX.)

It is true, that dyspepsia is often productive of excessive determinations to the head; but in ninety-nine out of a hundred examples of this kind, the connexion is so clear, as not to be mistaken; and the difference between this malady and nervous diseases

is too apparent, to admit of their being confounded by experienced physicians.

(DCCCCXX.)

On the other hand, various disorders of the stomach, as that accompanying the sick headach, are either the immediate effects of diseases of the head, or else are evidently efforts of the constitution to relieve general fulness, or excessive determination of blood to various parts of the system. This is more especially and frequently the case with regard to loss of appetite and vomiting, which then imply diseases of other parts, rather than of the stomach ; but, by the consequence of the present disorder of that organ, tend, ultimately, to cure the real and important malady.

(DCCCCXXI.)

Examples, however, occasionally, though rarely, occur, in which true dyspeptic pain in the head, and nervous determination to the same part, affect, at different times, the same patient ; and severally require, for their cure, their own distinct and appropriate remedies.

(DCCCCXXII.)

I have already endeavoured to shew, that the greater number of nervous diseases arise from excessive determination of blood to the head, and that dyspepsia is usually the produce of a similar cause in the vascular system of the villous coat of the alimentary canal.

(DCCCCXXIII.)

Now it is well known, that the diseases, which more especially precede gouty paroxysms, or occur in their intervals, are those of the alimentary canal and head. Of the former kind are flatulency, predominant acidity, heartburn, irregularity of appetite and of bowels, and different degrees of sickness; of the latter, listlessness, incapacity of attention, depression of spirits, dreaming sleep, weight or pain in the head, vertigo, &c. &c.

(DCCCCXXIV.)

During this excessive determination of blood to these important parts of the animal frame, there is, often, an unusual degree of coldness in the lower extremities, naturally proceeding from the defective balance of circulation. The coldness is often so great, that it is to be removed by no clothing, and only temporarily by the application of external heat. It seems to be seated, not merely in the skin, and near the surface, but as it were, in the most internal parts; so that the sensation continues, although the skin, to another person, who touches it, seems sufficiently warm.

(DCCCCXXV.)

Such is the state of circulation in the extremities, which usually precedes, and probably causes, the reaction of the constitution; which reaction is sometimes a mere aching, and preternatural heat, of those extremities, and, perhaps, occasional cramps; all of

which render exercise of these parts extremely fatiguing.

(DCCCCXXVI.)

At an early period of life, except in predisposed constitutions, reaction rarely goes beyond this degree; but at more advanced periods, especially in persons, who have been subject to excessive determinations of blood to the head, and alimentary canal, producing the symptoms before described, the reaction goes to the extent of causing gout, erysipelas, anasarca, or other inflammatory affections of the lower extremities.

(DCCCCXXVII.)

It has been remarked by Dr. CULLEN, and others, that, a few hours previously to fits of the gout, the patient often feels himself unusually exempt from the various maladies of the alimentary canal and head. This fact, which is correctly stated, is easily explained, on the supposition, that the excessive current of blood has, at that time, left these vital parts, and is, as it were, in transitu towards the extremities.

(DCCCCXXVIII.)

During this passage, as I have before observed, a disposition towards the inflammatory state often shews itself, not only by the aching and cramps already mentioned, but by the unusual painfulness of corns or bunnions, and by swelling and soreness of small subcutaneous glands about the fore part of the tibiæ.

(DCCCCXXIX.)

The coldness which I have described, (DCCCCXXIV.) is often spontaneous; but it is often produced by assignable causes. Among these are,

First, and most commonly, the immediate abstraction of heat from the lower extremities by exposure to cold, especially when conjoined with moisture.

Secondly, the want of exercise in walking.

Thirdly, late hours.

Fourthly, Venus nimia.

Fifthly, various determinations to other parts, as erysipelas in the face; and even long continued pain from calculus in the ureter.

Sixthly, indigestion with costiveness.

Seventhly, mental anxiety.

From which ever of these, or other, causes, great coldness is induced on the lower extremities, especially if that coldness be of long duration, the accession of a paroxysm of gout may, in predisposed habits, with considerable certainty be predicted.

(DCCCCXXX.)

In there paroxysms, the aid of the heart is usually, but not always, contributed towards the restoration of the long defective determination; and by this process, as by that of ague, the constitution is, for a greater or less length of time, relieved from those disorders, or from that tendency to disorder, under which it had before suffered.

(DCCCCXXXI.)

In the first beginnings of gout, a very short period seems sufficient in order to restore the due balance of circulation; and the patient is absolved by one fit of inflammation of thirty-six or forty-eight hours duration in a single joint, which is followed by œdematous swelling and the speedy recovery of health.

(DCCCCXXXII.)

But at a more advanced period of life, each attack of gout consists of several distinct inflammations of different parts, occurring in succession; with short intervals, during which not only those parts of the extremities, which have not been affected, still remain preternaturally cold, but even the toes shall be cold, while the instep of the same foot suffers burning heat.

(DCCCCXXXIII.)

On these occasions, the reaction is often assisted by slight coldnesses down the back, or even by rigors, which begin the new paroxysm, and are followed by an increase of a febrile state, which, probably, had never wholly subsided.

(DCCCCXXXIV.)

Thus the disorder proceeds, till, if the progress be favourable, a complete restoration of warmth in the extremities ensues; and it is worthy of observation, that one of the best evidences of convalescence is the speediness, with which a comfortable glow of heat

follows any coldness, which may have occurred about the usual period of post-meridian febrile accession.

(DCCCCXXXV.)

This quality and order of phænomena clearly mark the nature of that reaction, which constitutes the essential character of true gout; and, at the same time, shew, that, while one final cause of that malady may be, as formerly stated, (CCCCV.) (CCCCVI.) the evacuation of the habit, and the consequent reduction of a plethora, which is relatively excessive, another end is the restoration of the due balance of circulation, previously determined in excess towards other and more vital parts.

(DCCCCXXXVI.)

Under this latter view, we may conceive how gout may occur to persons, in whom there is in reality no general plethora; the final cause of the malady being merely the correction of the irregularly directed circulation.

(DCCCCXXXVII.)

These two different conditions of the constitution, therefore, indicate two distinct states, under which a patient may suffer what is called Gout; the first being chiefly a spontaneous attempt to relieve general plethora, and the second a process, to rectify a defective balance of circulation.

(DCCCCXXXVIII.)

It must not, indeed, be asserted, that the two processes may not be occasionally combined. The latter, is, in fact, often the cause of the former; but experience does certainly shew numerous cases, in which they are altogether distinct and uncomplicated.

(DCCCCXXXIX.)

There is, however, a third mode of the production of gout, not sufficiently attended to by medical practitioners.

(DCCCCXL.)

It is a fact, with regard to various diseases, that the part, which is respectively their seat, shall be often, and perhaps long, exposed to one or more of their causes, without apparent injury; and yet, long after the remote cause has ceased to be applied, the state, denominated morbid, shall afterwards occur, with a force proportioned to that of the cause, which has thus elapsed.

(DCCCCXLI.)

Of this principle it would be easy to accumulate proofs; but it may be sufficient here to exemplify it by the case of Dyspepsia. Persons, who, from certain ingesta, are prone to this malady, and who usually feel the disorder soon after the application of the cause, shall, on some occasions, more especially in advanced life, long continue a similar application with apparent impunity. Eventually, however, the usual

consequences will arise, and that even to a greater extent, and for a much longer period, than on former occasions, when they followed the cause in more rapid succession.

(DCCCCXLII.)

Hence, I think, it evidently follows, that one link of the phænomena constituting dyspepsia is a state of reaction, intended, in some unknown method, to restore the health of the part, which had been, to a certain degree, impaired by the force, or long continuance, of the noxious cause.

(DCCCCXLIII.)

In farther proof of this conclusion, it may be observed, that soon after the symptoms have thus ceased, either in consequence of the spontaneous actions of the constitution, or the administration of remedies, the more healthy power of the part now existing, noxious ingesta are more sensibly felt, and the stomach experiences a more speedy inconvenience, or, in stricter language, a more speedy salutary reaction, than during the former state.

(DCCCCXLIV.)

When the alimentary canal is equal to the task of restoring, by its own powers, its own functions, then, conformably to the principles already laid down, the assistance of the general circulation is rarely called in.

(DCCCCXLV.)

But, on other occasions, a general reaction of circulation ensues, with circumstances differing according to the constitution of the patient, as to age and other powers, or causes, of predisposition. Thus, I have often known a true fit of fever follow eating melon, and other indigestible substances; during which, the action of the heart has been vehemently augmented, till, in consequence of the increased impetus of blood, an effect has arisen, similar to that which I have stated as following compression of the carotid arteries in dyspepsia. The peristaltic motion of the alimentary canal, before too languid, is now excited, the noxious contents change their place, and, almost immediately, the excessive action of the heart ceases.

(DCCCCXLVI.)

On other occasions, in which the alimentary canal, exposed to noxious causes, has, as before mentioned, suffered no reaction, and, therefore, no sensible disease, that part becomes violently affected, and the patient labours under total inappetency, flatulency, heartburn, and many others of the worst symptoms of dyspepsia.

(DCCCCXLVII.)

This condition is, for the most part, caused by fever; which, gout in the extremities, instead of succeeding, often accompanies, and sometimes even precedes.

(DCCCCXLVIII.)

Here, then, gout and dyspepsia, instead of being to each other in the relation of cause and effect, are the simultaneous effect of one common cause, a general reaction of the sanguiferous system, intended, perhaps, to relieve the stomach itself, but affecting the capsular ligaments of joints, sheaths of tendons, &c. by extension of excessive momentum to predisposed parts.

(DCCCCXLIX.)

This, then, is a third modification of the process which produces gout.

(DCCCCL.)

In this last modification, however, it does not seem necessary that the increased momentum should always begin, as it were, for the immediate relief of the alimentary canal; for the fit shall perhaps be brought on by the evident operation of cold and other causes, as already described; and then the state of the alimentary canal, as under the last modification, shall ensue.

(DCCCCLI.)

In the same manner, increased determination to the mucous membrane of the bronchia shall often accompany, in exact proportion, the fever attendant on gout in the extremities, throughout its commencement, acme, and decline.

(DCCCCLII.)

This, and some other examples, form an exception to a general rule before mentioned, that two local excessive determinations of blood seldom exist at the same time.

(DCCCCLIII.)

So also gout in the extremities will often occur during fevers attended with local inflammation, the original seat of which has been determined by casual circumstances. In such cases, the predisposition to gout has superseded the accidental affection, and the former has gradually taken place of the latter.

(DCCCCLIV.)

When, during excessive determination of blood to vital parts, or speedily after it, salutary gout appears in the extremities, we are not to presume that the change is always accompanied with that general affection of the sanguiferous system, which constitutes what we call fever. Such changes certainly often occur, without any sensible febrile state.

(DCCCCLV.)

On the other hand, we cannot, on all occasions, infer, that no general affection of the sanguiferous system exists, because it has escaped our observation. The menstrual discharge in females is often unaccompanied with any change in the pulse; but if a woman, otherwise healthy, has a wound, the period of menstruation will frequently be distinctly perceived by

the discharge, and other circumstances, of the wounded part.

(DCCCCLVI.)

When gout occurs in this mode, we shall find that the relief of previous diseases is usually prior to the fit, and not subsequent to it. The paroxysm of gout is the consequence of the change of the excessive current of blood from the parts previously affected.

(DCCCCLVII.)

In the same manner, disorders of the head, and other parts, often appear to be relieved by a few drops of blood from the hæmorrhoidal vessels; whereas the relief is not owing to that trifling discharge, as such, but to the change of determination which produced it.

(DCCCCLVIII.)

Such, then, being the chief pathological states of gout, as illustrative of the principle of reaction, it will remain for me to consider that malady under other views, in a subsequent part of this work.

(DCCCCLIX.)

The following set of phænomena, altogether unnoticed by authors, is highly illustrative of the principle of reaction in general, and of gout in particular.

(DCCCCLX.)

After any long continued exertion of the lower limbs in walking, so as to produce fatigue, certain

persons, from their earliest youth, have been accustomed to feel an aching in the legs and feet, accompanied with a sort of tingling or formication, which has seemed as if it arose from a tremulous motion in every distinct fibre of every muscle, composing the fleshy substance of those parts. As, however, it has existed where there are no muscular fibres, and has always been attended with a sensation of glowing heat, it seems to be owing to an increased determination of blood to the minute arteries, or capillaries, of the parts affected.

(DCCCCLXI.)

This conclusion is confirmed by the following circumstances.

First, if a part, as for example, the hand, has become extremely cold by exposure to frost, a short time after it is placed in a warmer temperature, it experiences, as its heat returns, the very formification, or tingling, which has been described. Now, that the sensation depends on the increased afflux of arterial blood, will appear, when we consider, that this very increased afflux, when in a certain degree, produces cutaneous eruptions, chilblains, rheumatic or gouty inflammation, and even mortification itself.

Secondly, a similar tingling, all over the skin, evidently from a similar cause, was the first sensation of a patient, on the return of circulation, which had been long suspended by drowning.

Thirdly, in the experiments, by Mr. KELLIE, on the compression of arteries by the tourniquet, shortly

after the tourniquet was loosened, a strong tingling was perceived in those parts, to which the flow of blood was thus restored.

(DCCCCLXII.)

In these different cases, the tingling may be considered as the evidence of the reaction of circulation, essential to the health of the part; and since experience has shewn me, that the extent and quickness of the recovery of the strength and activity of the lower limbs, after fatigue, has been proportioned to the degree of this tingling, we may consider it as being, in this case also, a salutary reaction.

(DCCCCLXIII.)

I reserve for a future occasion many other important circumstances relative to this peculiar symptom, all of which tend to shew, that it is owing to increased momentum of blood, and of a salutary nature.

(DCCCCLXIV.)

It may, however, be remarked here, that certain persons never enjoy health, or muscular strength and activity, unless this tingling occurs, when, in a morning, their eyes first receive the impression of light.

(DCCCCLXV.)

In one of these persons, it always occurred during the beginning of gout in the lower extremities, more or less accompanied its progress, and occasionally continued for some time after the fit had ceased. If

the gout affected one foot only, the tingling chiefly affected that extremity, and was sometimes wholly confined to it. When the gout and tingling co-existed, whatever increased the latter, always, in a proportionable degree, aggravated the former.

(DCCCCLXVI.)

If also, for several months together, this tingling did not occur, either after walking, or in a morning, especially if the patient did not experience fatigue from bodily exercise, then a fit of gout infallibly followed.

(DCCCCLXVII.)

On the other hand, when walking was succeeded by lassitude in the lower limbs, and by the tinglings as above mentioned, then, as if such reaction was equivalent to that of the gout, this malady did not occur.

(DCCCCLXVIII.)

From all these circumstances, it appears that the tingling, which I have described, is a salutary reaction, probably of the sanguiferous system, and in its nature closely bordering on gout.

(DCCCCLXIX.)

Very much akin to this tingling, and usually attending it, though sometimes occurring without it, is that sense of aching, before mentioned, in the whole lower extremities, from the knees to the feet, which often comes on spontaneously, especially in the

horizontal posture. It is exactly similar to the weary aching produced by muscular fatigue of the lower limbs, though it sometimes occurs without that cause. It is common in nervous women, and other persons, who, sometimes, on account of this resemblance, deny in the morning that they have been at all refreshed by their night's sleep.

(DCCCCLXX.)

This aching often alternates with determination of blood to the head, whether of the nervous kind, or consequent on fœcal obstruction in the alimentary canal.

(DCCCCLXXI.)

It has already been shewn, that gout and tingling are salutary processes. That the aching is also owing to salutary determination is certain ; for, in the first case, just mentioned, the affection of the head is always lessened, when this uneasiness of the lower limbs exists ; and, in the second case, the aching occurs as soon as the fœcal obstruction, as in contracted rectum or colon, is removed by purging. On this occasion, the state of the lower extremities sometimes actually resembles a local fever ; terminating in sweating of the part, and uniformly relieving that morbid condition of the head, to which the fœcal accumulation had given birth.

(DCCCCLXXII.)

The three states of gout, tingling, and aching,

have, in common, this circumstance, that they are occasionally accompanied with actual startings or twitchings of the whole limb, or of particular muscular fibres of the limb.

(DCCCCLXXIII.)

That they equally arise from increased local determination of blood, appears, not only from the common circumstances of the two latter with gout, which is evidently a case of that nature, but because there is, in all the three, an evident increase of the heat and fulness of vessels in the affected parts.

(DCCCCLXXIV.)

So, also, all of them are, for the time, diminished by pressure, as by tight shoes, &c.; but recur, with aggravated force, when the pressure is removed.

(DCCCCLXXV.)

They are, also, alike capable of being suspended by determinations of blood to distant parts; as erysipelas of the face, the passage of a calculus through the ureter producing excessive pain, or by any other cause, which occasions great, and more especially long, preternatural coldness of the lower extremities.

(DCCCCLXXVI.)

To the above proofs it may be added, that these three affections are not always accompanied with increased action of the heart, but that, when they are,

they exhibit themselves with proportionably greater force.

(DCCCCLXXVII.)

On more than one occasion, when ingesta, usually producing dyspepsia, have been frequently, and at near periods, taken without that effect, the evidence of reaction has been true vertigo. This, at least, has been the first symptom noticed; but, about the same time, there has been a glow of heat over the patient's whole head, soon followed by an increased motion in the alimentary canal, and that tingling of the feet and legs, accompanied with increased warmth, before described. The subsequent feelings of the patient have been so much improved, that the whole process was evidently a salutary one; but whether the vertigo, in such cases, is the cause of the other symptoms, or only a collateral effect of the general sanguineous reaction, I cannot determine.

(DCCCCLXXVIII.)

One patient, for many years subject to epilepsy, which, for eighteen years, used to return once a month about the menstrual periods, was for eight months perfectly free from that malady, after having for a fortnight constantly laboured under vertigo.

(DCCCCLXXIX.)

Another, not uncommon, modification of reaction, with regard to the alimentary canal, consists of the following symptoms. The patient feels, in some part

of that tract, a torpor, soon followed by a dimness of sight, which is often produced as it were by a brownish opake spot in the very centre of both eyes; so that he can see nothing strait before him, but can distinguish objects all around that centre. After a short time, a corruscation of light, in a zigzag form, plays rapidly backwards and forwards at one corner of what seems to be one eye only; but, on trial, is found to be common to both. The dimness now gradually goes off, especially if the patient discharges flatus, or has a rumbling movement of wind in the bowels. If no such corruscation occurs, or if it very speedily ceases, severe affections of the head, as pain, confusion, vertigo, a forgetfulness of proper words, &c. together with a painful sense of stricture in the stomach, or colon, succeed: and these symptoms do not subside, till much flatus, or other contents of the canal, have freely changed their place. Hence it follows, that such luminous corruscations are an evidence of salutary reaction in the brain; which, however, does not occur, if the alimentary canal is previously capable of sufficiently exerting its own salutary powers.

(DCCCCLXXX.)

From what has been said, in the preceding parts of this work, it appears, that the state of fever itself is one of the chief modes of reaction, intended to relieve either general disease, by general increased momentum, and its consequences, or, in local morbid affections, to afford aid to parts incapable of restoring

themselves by their own powers. Of these processes, many examples have been pointed out.

(DCCCCLXXXI.)

In our present state of knowledge, it is, however, impossible to ascertain, on all occasions, the cause of fever. The difficulty as to this point is much enhanced by the fact, already noticed, that a mere local cause of malady, applied to one part, and thence occasioning general constitutional affection, shall produce violent local disease of another part, previously disposed to be morbidly acted on by increased impetus. Thus cold, applied to the mucous membrane of the nose and throat, will produce catarrh attended with general fever ; which, in a predisposed habit, will end in gout in the extremities. So of many other diseases. In the example last specified, we might very readily attribute the whole constitutional malady to some gouty reaction, when, in reality, that affection is only a casual effect.

(DCCCCLXXXII.)

My experience in intermittents is insufficient to enable me to ascertain what specific cause of disease it is, in those cases, the object of the febrile process to obviate.

(DCCCCLXXXIII.)

Nor am I always more able to decide, when the local diseases, which exist, and often prove fatal, in many other varieties of fever, may be considered as

indications that the offending cause was originally applied to those several parts, so as to call in the aid of the general circulation; or in what instances they are the casual effects of general increased momentum on parts perhaps predisposed, in individual patients, or in the mass of persons exposed to the operation of such causes.

(DCCCCLXXXIV.)

Under this head may be reckoned the affection of the mucous membrane of the alimentary canal in remittent fevers; of the same membrane, in the same part, and in the fauces and bronchia, in fevers of the typhoid and other protracted kinds; of the liver, in agues; of the brain, in various febrile maladies; &c.

(DCCCCLXXXV.)

So, also, in the more common local diseases, attendant on excessive general momentum.

(DCCCCLXXXVI.)

In such cases it is evident, that, in directing our remedies to the cure of such local affections, we are, strictly speaking, prescribing only for symptoms. This subject, in all its relations, more properly appertains to a subsequent part of this work.

(DCCCCLXXXVII.)

In various of the preceding sections, I have noticed, not only those natural processes, which tend to re-

lieve local maladies, but those also, which free the entire system from habitual states, inconsistent with the due performance of its several functions. These processes demand some farther attention in this place.

(DCCCCLXXXVIII.)

We observe that persons, under the greater number of febrile diseases, suffer a considerable diminution, and sometimes a total loss, of appetite, together with a wasting of the flesh. These circumstances may justly be considered as contributing to the restoration of health.

(DCCCCLXXXIX.)

Similar symptoms, either singly, or in combination, occur from the same final cause, in many chronic maladies, and especially in those denominated nervous. Wherever the course of such symptoms is uninterrupted by the officious interference of physicians or friends, their salutary effects are uniformly observable; and this fact itself is a strong evidence of the nature of such maladies.

(DCCCCXC.)

On the other hand, in febrile affections, when fever declines, and the tongue becomes clean, an appetite, often preternaturally great, supervenes.

(DCCCCXCI.)

Those, however, who indulge it without restraint,

usually, sooner or later, suffer severe attacks of dangerous disease, of a great variety of kinds.

(DCCCCXCII.)

These effects seem to be pretty exactly proportioned to the weakness and extenuation, whether spontaneous or artificial, which the patient has undergone during the preceding malady.

(DCCCCXCIII.)

In such cases, and many others, as hæmorrhages, &c. if the repleting system produce speedy disorders in the alimentary canal, such as loss of appetite, nausea, vomiting, or diarrhœa, it is well. The constitution acts in its own defence, and, by the less, precludes the greater evil.

(DCCCCXCIV.)

In other examples, the reaction is of a different, but still speedy kind. A single full meal has produced violent palpitation of the heart, and even rigor, febrile determination to the head, and death.

(DCCCCXCV.)

These effects seem to result from the operation of food, as an almost direct cause of increased action of the heart; but in many cases the process is more slow. The patient congratulates himself, that the enjoyment of his meals is so much greater than before his illness. He becomes fat, and his friends compliment him on his good looks.

(DCCCCXCVI.)

Soon, however, some series of movements occurs, constituting what is called disease, but what is, in reality, intended for the relief of the over-burdened and oppressed constitution. Of this kind are, chiefly, hæmorrhages from various parts, cutaneous diseases, the whole train of nervous affections, inflammations, and more especially gout, dropsies, and other increased secretions and excretions. The same purpose is sometimes, though more rarely, answered by long-continued, simple synocha.

(DCCCCXCVII.)

Of these movements, though evidently intended for the relief of the general constitution, the result may be ultimately salutary, or the reverse, relatively to the part on which the impulse takes place. Thus, the constitution may be beneficially lowered by hæmorrhage from the nose or hæmorrhoidal veins, by erysipelas, or by long arthritic inflammation, followed by anasarca; while death may ensue from hæmorrhage from the stomach, or from the slow process of hectic fever, attendant on inflammation of the mesenteric or pulmonary glands, &c.

(DCCCCXCVIII.)

The state which I have thus described, with all its consequences, is what we every day see occurring to men, who have been long engaged in employments, which are either of a mechanical kind, or which re-

quire a great deal of bodily exertion; and who retire to enjoy, in affluence, what they consider as a happy life of indolence and gluttony.

(DCCCCXCIX.)

If the representation, which has thus been given, be just, we can well understand why many local diseases cannot be removed, or even, in a certain degree, checked, by local remedies, without the hazard of converting a topical into a more general malady, or of causing a constitutional effort on some other part; which part may be more essential to life, than that which the attempt was made to relieve.

(M.)

The same evils may attend the administration of certain internal remedies, the tendency of which is not to cure the constitution, and so remove the necessity of the local disease, but merely to check the present salutary action of the system, and thus to cause only a temporary and delusive suspension of present suffering. Such, in the far greater number of instances, is precisely the action of the Eau Medicinale, of Husson; the injurious, and even fatal, effects of which, local circumstances give me peculiar opportunities of witnessing.

(MI.)

As, however, various local diseases, besides gout, tend to relieve constitutional maladies, so the cure of

such diseases, by local remedies, is often equally injurious to the system. Of this principle many proofs have already been given. Many others might be adduced; and it is probably on the same principle, that the artificial removal of scirrhous mammæ, and other parts, by the knife or caustic, has often appeared to shorten life, by the substitution of acute general disease for that which was topical and slow.

(MII.)

When such movements, usually called morbid, occur to persons under the circumstances which I have described, we can have little doubt that they are intended for the salutary purpose of reducing the constitution to that state, which is most consistent with its healthy functions. Accordingly we find in fact, that if no parts are rendered unfit for the offices of the system, patients so circumstanced usually recover, and enjoy, after a while, a better condition of bodily and mental health than before. In this amended state they continue, till an accumulation of the constitutional cause excites the system to another effort towards reduction.

(MIII.)

There are not wanting those, who would endeavour to prove, that all the movements, which take place in the animal frame, are processes of a salutary nature. I have, however, already shewn that this position, which is true in general, fails in individual cases.

(MIV.)

So, in particular, with regard to the various diseases of the head, already described; although we should admit that an increased determination of blood to the brain may, on some occasions, be essential to the well-being of some part of the animal system, or, more particularly, of that organ itself, and, therefore, of all the functions, both bodily and mental: yet, if the facts, which have been stated with regard to those diseases be true, that determination is, in such cases, the cause of the symptoms which follow, is often carried to an excessive and dangerous degree, and requires to be regulated by all the means, with which it has pleased Providence to furnish mankind.

(MV.)

So, also, the most correct experience justifies us in concluding, that, on many occasions, not only the degree of impetus, but even its direction, demands regulation and controul.

(MVI.)

This principle, as to degree, applies not only to local, but also to general, disorders; in which the whole constitution, or certain parts of it, may sink, from a defect of reaction, but more usually from its excess.

(MVII.)

The farther consideration of those phænomena in

the human frame, which constitute the natural processes intended for the restoration of health, will appositely be introduced, when the several diseases, in which the existence of such processes can be clearly traced, become the objects of more particular discussion.

EXCESSIVE DIRECT DETERMINATIONS OF BLOOD FROM COLD.

(MVIII.)

IN various parts of this work, mention has been made of the direct power of cold to diminish the afflux of blood to certain parts immediately under its influence. This fact being admitted, it must necessarily follow, that a greater quantity of blood will, at the same time, be determined to one or more other parts. Hence, probably, it is, that when the extremities are numbed with cold, they not only suffer a deep-seated sensation of aching, but, when pressed or struck with even a slight force, undergo a degree of pain, which, in the common state of circulation, would not be felt.

(MIX.)

This power of cold, when considerable, to determine blood to other parts, is proved by its effect, when externally applied to the thorax, in increasing or producing the pain, and therefore, probably, the

fulness of the heart, in the syncope angens, and of the thoracic aorta in aneurysms of that part; while, on the contrary, those effects are immediately removed, or relieved, by the external application of gentle warmth.

(MX.)

It may also be illustrated by the circumstances of that pain in the teeth, and swelling of the gums, without caries, which frequently occur from what is called catching cold. In such cases, cold water taken into the mouth usually diminishes the pain, while warm water increases it; and, inversely, cold applied to the outside of the cheek increases the pain, and heat diminishes it.

(MXI.)

So, also, when gout in the foot is deeply seated, and the skin is cold, the pain is relieved by moderately warm applications, and increased by cold ones; while, on the contrary, in more superficial gout, with hot skin, the contact of flannel, or any other mode of accumulating heat on the surface of the part, greatly aggravates the pain, which is immediately relieved by removing the excessive heat, and more especially by plunging the part in cold water. The nature of these different effects is too obvious to require a more particular explanation.

(MXII.)

The power of cold, in thus changing the balance of

circulation, is farther proved by its effect, when applied to the feet, in producing want of sleep, headach, and various other modifications of excessive determination of blood to the vessels of the head. Hence, we can readily see why immersion of the lower extremities in cold water, during gout in those parts, may change the determination of blood, and cause it, in a predisposed constitution, to fall on other parts, as the brain, the lungs, or the alimentary canal, so as to occasion any of the varieties of disease already stated as arising from that source.

(MXIII.)

It seems to be on the principle of a similar morbid change in the balance of circulation, that we see peritoneal inflammation so frequently produced by the first autumnal colds; and hemiplegia, and apoplexy, during the severity of winter, so often occurring in persons, whose advanced age has greatly reduced the power of salutary sanguiferous reaction.

(MXIV.)

It is, probably, owing to the same cause, that hemiplegia and paraplegia have both been suddenly produced by going into a cold bath.

RECAPITULATION.

(MXV.)

THUS have I endeavoured to shew,

First, that the far greater number of the diseases, incidental to the human frame, depends, at some point or other of that succession of antecedent circumstances, which constitutes the chain of causes, on excessive momentum of blood, whether local or general.

Secondly, that this momentum is not, necessarily, always excessive absolutely, that is, in relation to the usual state of perfect health in the mass of mankind; but relatively to the state of the individual at the period given.

Thirdly, that many of those movements, which constitute what is called disease, and which, for the time, produce disorder of the different functions, whether of body or mind, are, in reality, processes, the general tendency of which is to restore health, and to prolong life; although, on particular occasions, their operation may be either defective, on one hand, or excessive, on the other; or may be even sometimes

directed to parts, which seem, as it were, unnecessarily implicated in the vain and fatal conflict.

(MXVI.)

The view, which I have thus taken of animal pathology, is consonant to that simplicity, which pervades all the other known operations of nature. The blood is the material, from which, by the aid of its appropriate system of vessels, the animal is formed, its life preserved, and its health maintained ; and by the immediate affection of the same system, it chiefly suffers disease, decay, and death.

(MXVII.)

This theory is of a very different character from those, which deduce the greater number of diseases from an assumed disorder of one particular viscus or local function. It is founded on an observation of certain like phænomena, occurring in a system existing in every part of the body ; and, therefore, constituting a law, under which are comprehended the affections, not of one part only, but of the whole frame.

(MXVIII.)

Neither is it all incompatible with the opinions of certain ingenious pathologists, who would investigate the ulterior design of the several morbid movements of the animal system. On the contrary, while it admits, and even assumes, the general principle of salutary purposes, it tends to ascertain the means, or instruments, by which those purposes are effected.

(MXIX.)

The facts, by which the law has been illustrated or proved, have been, with a few specified exceptions, derived from my own experience. The results only, and not the particulars, have, for the most part, been given.

(MXX.)

For the pathological opinions I am solely responsible, except where the obligation has been expressly acknowledged; and even with regard to the anatomy, little has been admitted, which I have not myself verified by repeated dissections. The process, which I have followed, has been strictly conformable to the principles of science expressed in the commencement of this work.

(MXXI.)

Various repetitions will have been observed; but where it is designed to establish the order, as well as the quality, of phænomena, such repetitions are absolutely unavoidable; since the same fact, or principle, must often necessarily form the nexus, or connecting link, of different series.

(MXXII.)

What degree of accuracy there may be either in the notation or arrangement of the phænomena themselves, and, therefore, what truth in the theories, it will be for others finally to judge. No fact, unassigned to some other observer, has been admitted,

which I have not myself witnessed : and since the operations of nature are as uniform as they are simple, it is probable that he, who, with adequate opportunity, candidly and diligently seeks for truth, will not be wholly disappointed in the pursuit.

(MXXIII.)

It still remains for me to shew, how far the principles, which I have endeavoured to establish, accord with the causes and symptoms of the several diseases, on which I profess to treat ; and more particularly, with the most successful means of accomplishing their prevention and cure.

END OF VOL. I.

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APPENDIX.

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ELEMENTS

OF

PATHOLOGY and THERAPEUTICS,

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GENERAL THERAPEUTICS.

ELEMENTS

of

PATHOLOGY and THERAPEUTICS,

&c. &c.

VOL. II.

GENERAL THERAPEUTICS.

MEDICAL SOCIETY

GENERAL THERAPEUTICS.

THE EFFECTS OF HABITS IN CREATING PREDISPOSITION TO DISEASE.

(I.)

IN the preceding part of this work, I have endeavoured to establish certain general principles respecting the greater number of those congeries or trains of phænomena, which constitute what are called Diseases; and I have attempted to shew, that, in all, there is one condition, either cognizable by the senses, or admissible on the clearest grounds of induction; which condition is a degree of momentum or fulness of blood, excessive with regard to the usual state of the vessels of the part, or other circumstances of the system.

We are therefore prepared to commence some farther inquiries relative to the more remote causes, whether they constitute predisposition, or excitement.

(II.)

It is unnecessary to particularize all the circumstances, by which, in consequence of the modes of civilized society, Man is rendered liable to diseases, from which, in a state of more uncultivated nature, he is, in a great measure, exempt.

(III.)

Since, however, these habits form the chief predisposition to the diseases with which we are concerned, it is essential to the prophylactic part of this work, that the more important of them should be here considered.

(IV.)

We may first advert to that disposition, which is observable from almost the earliest periods of infancy, to attempt, by all possible means, the gratification of every want, and the removal of every present suffering.

(V.)

Although this principle, which is inherent in our very nature, and is, in the beginning, provided for by automatic motions, is evidently intended for the preservation of life, yet, under the want, or perversion of the means of practical instruction, it becomes the source of the greater number of physical evils which afflict mankind.

(VI.)

Attentive observation will also shew, that the

usual modes of early education among civilized nations are more instrumental in the production even of moral evil, than a state of ruder nature.

(VII.)

In the former state, the wants of infancy and childhood are satisfied as soon as expressed, and even anticipated and prevented. A similar conduct is observed with regard to those slight sufferings which are incidental to the frail state of humanity. Under both these situations, instead of being taught patience by reasonable denial, it usually happens that the child is gratified precisely in proportion to the violence of importunity; or else bribed into acquiescence by some commutation of sensual indulgence.

Thus he learns to consider present enjoyment as the end of his existence; and, concluding that the world was made for his pleasure, is averse to the torture of instruction, and hates those who contradict, or oppose him.

(VIII.)

To this criminal indulgence of innate propensities during childhood, may chiefly be traced those vicious habits which afterwards "grow with our growth, and "strengthen with our strength," are the bane of all social virtues, and unfit us alike for present and future happiness.

(IX.)

Among the lower orders of society, although the

general principles are precisely similar to those which have been thus described, the processes in some degree differ, conformably to the difference of the conditions of life. The child is indeed brought up more hardily, but he soons discovers that he can disobey with impunity, and that in spite of repeated positive denials, he can always, by querulousness, passion, or persevering importunity, ultimately gain his purpose.

(X.)

In no rank of life is there, in general, much choice as to the means, provided the end be obtained. If the child cry, it must be quieted. If benefit be to be procured, at the expense of inconvenience, however trifling, either the good must be absolutely relinquished, or acquiescence must be gained by some assurance or promise, which, the very next moment, the child discovers to be a falsehood.

(XI.)

From this representation, which the nature of the medical profession affords a thousand opportunities of verifying, it appears that the usual habits of civilized society place the earliest periods of human life in a worse situation with regard to the common principles of virtue, than those of the untutored savages.

(XII.)

The immediate cause of these errors is obvious. The parent, and the nurse, act, with regard to the

child, precisely in conformity to their own habits. Accustomed rarely to look for the regulation of their conduct beyond the feelings of the present moment, they apply the same rule to that being, whom Providence has entrusted to their care. They perceive that he is afflicted by the exertion of due authority; and the expressions of his affliction are intolerable to them. All therefore which they are anxious to accomplish, is their own immediate ease; and it is not till too late that they discover—if their ignorance or selfishness will permit them ever to discover—that, by their conduct, they have defeated their own purpose, and rendered inveterate those very evils which they strove to shun.

(XIII.)

Farther to pursue this important subject in its moral relations, would be inconsistent with the object of the present work. I have here only to shew the influence which this early practical encouragement of weakness and vice, has on the health of mankind. In this light, its consequences will appear from the following considerations.

(XIV.)

Human life consists in a continued series of irritations; and Providence has so ordered, that scarcely any earthly good is to be acquired without labour and suffering.

(XV.)

As also, on one hand, the good itself is enhanced by the difficulty with which it is attained ; so, on the other hand, there are few pains, whether of body or mind, which are not, within certain limits, alleviated by continuance or repetition.

(XVI.)

Hence, no one, probably, enjoys true pleasure, but he who has experienced pain ; and moderate evils are scarcely felt by those, who have been habituated to greater.

(XVII.)

On the contrary, men who are nurtured in habits of self-indulgence, not only bear with impatience those inconveniences, which are common to the rest of mankind, but possess an acuteness of perception, which converts indifferent impressions into actual sufferings.

(XVIII.)

But even in those cases, in which indolence and an assiduous escape from the common pains and irritations of life have been carried to a much less extent than that just specified, they naturally lead to a state of the system incompatible with happiness or comfort.

(XIX.)

The predisposition being thus created, every thing which can concur to the eventual torment of the

unhappy being through the greater part of the course of life, is, on principle, carefully superadded.

(XX.)

Towards this end the first step is the dereliction of bodily exercise ; so that when the youth, who, during boyhood, had derived his chief pleasure from every variety of muscular exertion, commences that occupation, which is to form the business of his future life, the exercise of his body by means of its own muscles almost wholly ceases.

(XXI.)

Hence, at the commencement of adult age, occur, in males, dyspepsia, headach, and various affections of the brain ; and, at a more advanced period, gout, dropsy, and all those complaints, which are called bilious.

(XXII.)

These maladies, with the exception of gout, fall still more heavily on the female sex, who, from the reputed decorums of civilized society, are at an earlier period of life, subjected to physical restraint. Hence, even while children, they are confined to long sitting in schools, or under governesses ; and, during the intervals of study, are compelled to relinquish all those exercises, in which boys, for a considerable time afterwards, freely indulge.

(XXIII.)

Nay, there are certain muscles, the use of which

fashion imperiously commands females to forego through life. Under the pretext of obtaining support to the trunk of the body, they are from their childhood cased up in stays, which prevent any flexion of the back bone. They can bend themselves only by the neck and hip joints, while the whole spine, from the neck downwards, is rigid and immoveable. Hence the muscles of the trunk, from disuse, become weak; and the ignorant parent or governess, finding herself, at adult age, incapable of keeping her own body erect without stays, fancies that this machinery is absolutely necessary to supply the defective work of Providence, in the construction of the child.

(XXIV.)

Such folly is visited with its proper punishment. To this cause, and the general want of other bodily exertion, is attributable that disposition to crookedness, which is so common among European females of a certain rank in life, but which is almost wholly wanting among Negroes, or other uncultivated nations, and rarely occurs to European males, unless their early habits have resembled those of females.

(XXV.)

Of this mechanical durance there is also another effect, hitherto, I believe, overlooked by pathologists. The chief muscle of respiration is the diaphragm; which, in healthy men, is alone used during rest, especially in the horizontal posture. In women, on the contrary, the stays, compressing the upper part of

the abdomen, prevent the descent of the diaphragm, and therefore compel them to inspire by the thoracic muscles only. Hence while females sit or stand, even at rest, the breasts rise and fall during respiration; and such is their habitual disuse of the diaphragm, that even when unrestrained by cloathing, and in the horizontal posture, they still breathe chiefly by the intercostal muscles.

(XXVI.)

The subserviency of free respiration to the growth, health, and strength of the animal frame, is well known to physiologists; and we can therefore readily understand how much the want of exercise, aided by the mechanical impediment, thus wilfully contributed by fashion and ignorance, must tend to counteract those blessings, and to prevent or destroy that beauty, which, without them, cannot exist.

(XXVII.)

A very striking analogical effect of this impeded descent of the diaphragm, in the production of certain symptoms of well known diseases, will hereafter be mentioned in its proper place.

(XXVIII.)

Another consequence, not peculiar to females, though more common with them than males, which seems very immediately connected with this defect of respiration, is Chlorosis. This condition may occur at all ages, but is most usual about that of puberty. It

has been supposed, and to all appearance justly, to arise from the want of a proper influence of oxygen on the blood as it circulates chiefly through the lungs; and it may, with almost absolute certainty, and without the aid of medicine, be cured by a due degree of muscular exercise in the open air.

(XXIX.)

Another, and still more important effect of early disuse of exercise, is, I think, Scrofula ; that malady, which, in form of pulmonary consumption, is so destructive of the young, the delicate, and the lovely among the human race. Like chlorosis, it is not peculiar to females ; but it chiefly occurs among them, and among those males, who live in similar habits of indolence, confinement, and delicacy.

(XXX.)

Of the species of self-indulgence thus described, the natural offspring is the habitual use of Gestation, whether on horseback, or in carriages.

(XXXI.)

With regard to riding on horseback, it is usually a mere apology for the want of that exercise, which Providence evidently intended that man should take by means of his own limbs, and not those of another animal.

(XXXII.)

Accordingly we find, that exclusively of the positive

diseases which spring from this mode of gestation when violent, those who trust to its more moderate use, and, more especially, those who substitute it for accustomed bodily labour, are at least as subject to dyspepsia, gout, dropsy, hæmorrhage, the whole train of nervous affections, mania, hysteria, epilepsy, paralysis, and apoplexy, as those who lead the most indolent lives.

(XXXIII.)

Many persons indeed assert their inability to walk to any extent, or to employ any other active exertion. It heats, it fatigues, it pains them; it produces a thousand real or imaginary inconveniences; whereas the exercise of riding is in no degree fatiguing, and, therefore, must be infinitely more beneficial.

(XXXIV.)

This very argument is an absolute dereliction of the point which it wishes to establish; since it proves, first, that the exercise of certain muscles gives strength to those muscles, while it leaves in a state of debility others, which are habitually unexerted; and, secondly, that the indisposition to incur present inconvenience by such exertions of new muscles, implies that state of mind, already mentioned as being weak, and worthy of reprobation.

(XXXV.)

Of the power of exercise to strengthen muscular parts, daily experience gives us the most satisfactory

proofs, not only in man, but in the inferior animals. We might otherwise expect to see, in Europe, greyhounds trained for coursing astride of hunters ; and, in India, horses fitted for racing by being trotted on the backs of elephants.

(XXXVI.)

Whoever pleads mere fatigue, or a temporary diminution of ease, as a reason for shunning muscular exercise, and waits for that exercise, till his strength shall have been previously improved, inverts the true order of nature, by which, conformably to a well-known proverb, it appears, that increased muscular power is the effect, and not the cause, of increased muscular exertion.

(XXXVII.)

The indolence, thus supported, and as it were sanctified by horse-exercise, produces its baneful effects, not only on those parts which are the instruments of the mental determinations, but on those which constitute organic life.

(XXXVIII.)

In what mode muscular exertion, duly extended, acts salutarily on the sanguiferous system, and its dependencies, through the medium of the veins, I have already endeavoured to suggest.

(XXXIX.)

Such a process is, by incontrovertible proofs, very

inadequately, if at all, supplied by exercise on horse-back, under the use of which the feet grow cold, the face flushes, and the lower extremities of persons so indulging themselves, become conspicuously small.

(XL.)

Under this habit also, as under that of a sedentary life, the heart, like voluntary muscles, is thrown into inordinate actions, by the slightest irritation, whether from exercise or mental emotion; the due balance of circulation is disturbed; the blood undergoes a defective decarbonization; and the secretions and excretions are either diminished on one hand, or more or less excessively increased on the other, or are vitiated as to their quality.

(XLI.)

The maladies, therefore, to which such habits predispose, are of a most serious and extensive nature, and comprehend those of the heart, respiratory organs, alimentary canal, and liver; the whole train of nervous affections, including excessive determinations of blood to the head; all inflammatory diseases, whether of serous or mucous textures, glands, capsular ligaments, &c.; together with all the effusions, which are the consequences of these several states.

(XLII.)

If these consequences result from habits of horse-exercise, they are certainly not less attributable to the fashionable mode of gestation in carriages.

(XLIII.)

It will readily be conceived, that such a remark cannot refer to the habit of gestation as a means of easy and rapid communication between remote places. If, however, such modes conduce to the convenience of mankind, the conclusion as to their effect upon health will not, on that account, be in any degree vitiated or weakened.

(XLIV.)

Neither do such observations extend to the case of those persons who, either from organic infirmity of their limbs, or from the debility consequent on acute diseases, are, at the time, incapable of moving their bodies by means of their own muscles.

(XLV.)

The indolence to which I have adverted, is peculiarly injurious when conjoined with full meals, especially of animal food. To such excess we are, however, habitually stimulated by every variety of taste produced by the arts of cookery, by the admixture of condiments, and by the interposition of Alcohol in its different forms.

(XLVI.)

This habit of indulgence in the pleasures of the table, under various modifications, especially occurs to persons rather beyond the middle periods of life; to men who have become affluent in laborious occupations, and to females who have been pampered

during frequent pregnancies. From the combination of indolence and gluttony arises a degree of obesity, as offensive, as it is destructive of the little mental and bodily power, which the prior habits themselves would otherwise have permitted to remain.

(XLVII.)

The coincidence of obesity, or plethora, with indolence, not only produces a great predisposition to diseases of the alimentary canal, liver, head, heart, organs of respiration, and serous membranes, but also renders patients irrecoverable from numerous casual disorders, which, otherwise, would have been attended with no important consequences.

(XLVIII.)

Among the practices consequent on the mental weakness already described, may be reckoned the use of wine and other modifications of alcohol, as a part of constant diet; and which few persons would habitually take, were they not temporarily relieved from certain degrees of mental or bodily torpor, which they have not the fortitude to sustain, or the patience to relieve, by slower, but more effectual means.

(XLIX.)

In reality, the extent of this habit among men in certain ranks of life, is enormous; and persons, who would with disdain repel the imputation of drunkenness, are nevertheless satisfied to continue the use

of such liquors, in any quantity which may serve, for a time, to raise their bodily and mental power above their natural and healthy level, provided they stop short of absolute inebriation.

(L.)

Nothing, however, can be more erroneous than such a conclusion; since it is true in fact, that those persons who act on this principle are subject, at least equally with habitual drunkards, to the fatal effects of such practices. Of this assertion it would be easy to accumulate proofs from the examples of those, who have acted the most conspicuous parts on the public theatre of life.

(LI.)

With regret, I am compelled to attribute to the medical profession itself much of that perseverance in these delusive modes of exercise, and in the habitual use of stimulating fluids, which have here been reprobated; practices, to which, in what is called civilized society, mankind would be of themselves sufficiently prone, but which would not reach their present degree and extent, without the strong sanction of medical authority.

(LII.)

The union to which I have adverted of indolence, a superabundance of animal and highly spiced food, and an inordinate quantity of fermented liquor, which, contrary to analogy and direct experience,

custom has made concur with the natural heat of our colonies in the East and West Indies, has contributed much more powerfully than the heat itself, to make those countries the grave of Europeans.

(LIII.)

To the same overwhelming authority of fashion, persons in the middle and higher ranks of life are indebted for an almost total inversion of the periods which Providence, with a strong and commanding voice, has appropriated to the different purposes of exercise and rest.

(LIV.)

Late hours naturally lead to fever, and proportionate lassitude, and it is hardly probable that he, who, from whatever cause, has watched through the greater part of the night, will feel himself disposed, or able, to pursue the means of bodily and mental health through the ensuing day.

(LV.)

Even the power of light itself upon the animal frame, though slightly touched on by an ingenious Poet and Physician, chiefly from the analogy of its effects on the vegetable kingdom, has been scarcely noticed in its important practical relations on the sanguiferous system.

(LVI.)

Another evil, attributable to similar causes, is the

habitual exposure to the heat of large fires, and the indiscriminate use of flannel garments next the skin, both of which tend to produce excessive action of the heart, and to make the frame morbidly susceptible of the action of cold, during that exercise which is essential to health.

(LVII.)

In a former part of this work it has been observed that various animals dependent on man, and accustomed to indolence and similar indulgences, acquire a disposition to like diseases. Thus singing-birds and lap-dogs, which are confined and highly fed, are subject to the whole train of nervous affections; as palpitation of the heart, breathlessness on slight motion, hysteria, convulsions, epilepsy, hemiplegia, and apoplexy. So of various diseases in other domesticated animals.

(LVIII.)

These general facts shew, beyond all dispute, the truth of the proposition, that the predisposition to the worst maladies of the animal frame grows out of those habits, which are chiefly peculiar to the condition of civilized society.

(LIX.)

The view thus given is a very cursory one. It is however derived from actual and long observation; and is not the less just, because, conformably to the nature of this work, I have omitted the detail of

facts, by which it is proved; or because, in giving it, I have neither flattered the prejudices, nor soothed the weaknesses, or the vices, of mankind.

(LX.)

To the early desuetude of restraint, and the habits of self-gratification above mentioned, we may attribute many of those intemperate indulgences of natural appetites, which act both as predisposing and exciting causes of various maladies.

(LXI.)

Inde apud mares oritur Veneris cultus præcox et effrænus; quo nihil mentem magis infirmat, nihil corporis vires magis frangit, nihil articulorum, ventriculi, cordis, cerebri morbis, virum magis obnoxium reddit.

(LXII.)

It is also worthy of cursory remark here, but will hereafter deserve amplification in a more appropriate place, that habits of mental indulgence not only interfere with the administration of remedies, where disease exists, but actually, through a moral obliquity, pervert their natural operation on the human frame.

PREDISPOSITION FROM HABITS, A CAUSE OF INCREASED DETERMINATION.

(LXIII.)

IF then it be true, that these different circumstances give occasion to the more ready production of the local diseases which have been specified; and if it be also true, that a main and essential link in the chain of phænomena leading to such diseases, is an excessive determination of blood to the parts so affected, it must follow, that these predisposing causes tend to the production of that increased determination.

(LXIV.)

I have already remarked, that this state of increased impetus, in the vessels of the affected part, has reference only to a certain state of such maladies, and that, although, in consequence of the inaccuracy of language, the same name is made to include different stages of the same malady, yet the states, thus designated, may essentially differ among themselves at different periods.

(LXV.)

Thus in Inflammation; although the first sensible deviation from the natural state of circulation in the vessels, is an unusual flux of blood within the part, constituting an increased momentum, yet, in the subsequent stages, that momentum may so far disappear, that the blood may for a while stagnate in the capillaries, until a renewed or increased contraction of those vessels may occur, and gradually produce the usual phænomena, which attend certain local salutary processes in inflammation.

(LXVI.)

So of other diseases, already specified, not amounting to inflammation.

(LXVII.)

It is the first of those states, on which all the subsequent phænomena depend, to which I wish chiefly to call the attention of the reader in this place.

(LXVIII.)

This state must be the joint product of the condition of the part, and the exciting cause acting on it.

(LXIX.)

Conformably to the general principle already laid down, under a strong predisposition, a slight exciting cause is sufficient to give rise to a malady; and conversely, under a slight predisposition, a strong exciting cause is requisite.

(LXX.)

I have elsewhere endeavoured to shew that the larger arteries have two powers, by which, when dilated to a certain degree, they can, within certain limits, contract themselves; the first, and least extensive, being the mechanical power of elasticity, and the second, and most extensive, being their tonic or vital power.

(LXXI.)

I have also proved, that, in health, those arteries are always in a forced state of dilatation with regard to both powers; so that, when the distending cause, or the blood which they contain, is removed, both their elasticity and tonicity visibly act, and jointly tend to reduce the light of the vessel.

(LXXII.)

Since also it appears, that, as long as organic life continues, the tonic power of such vessels contracts them within the sphere of their elastic power, which however operates to re-expand them to a certain degree, after their organic life has ceased, we have reason to infer that this tonicity acts only in a mode similar to that of muscular parts, that is, by shortening the texture possessing it; or, in a hollow part, by reducing its area.

(LXXIII.)

Now as there is reason to believe that capillary vessels, employed as conduits for carrying on the

circulation, have powers similar to those of the larger arteries, though perhaps differing as to the proportion of those powers, we have no reason either from analogy or actual observation to conclude, that, when unduly dilated, they owe this state to any other causes, than either an increased force of dilatation within, or a defect either of tonicity or mechanical resistance.

(LXXIV.)

When, however, we observe the sudden changes which occur in the state of these vessels, so that, not only the contact of a grain of sand with the conjunctiva shall almost instantly fill with blood the capillaries of that part; and, more especially, when we contemplate the instantaneous effects of certain mental emotions, in causing a rush of blood into the colourless vessels immediately under the skin, without our being able, in either case, to discover any adequate change in the movement of the heart; we feel ourselves compelled to deny, that such causes can act immediately on the elasticity of the vessel, and, on the contrary, are disposed to conclude, that the phænomenon is dependent on a change produced on the tonicity of the minute vessels of the part.

(LXXV.)

It is true, that, in the first case, the capillaries affected do not seem to be of that class, which is intermediate between the arteries and the veins; and which, therefore, does not always carry red blood.

But it is these vessels which appear to be most conspicuously the seat of local inflammation and various other maladies; and the same circumstances of disease, and restoration to health, probably take place in both.

(LXXVI.)

Under this view, the cause of predisposition in the vessels of a part is their defect of tonicity, or vital contractility; which, conformably to what has already been stated under the head of various diseases, may exist in such a degree, as to admit of such diseases even under the natural impetus of the blood.

(LXXVII.)

Why, from the causes which have been detailed, such a disposition to local defect of tonicity should take place, we can, in many respects, at best only plausibly infer.

(LXXVIII.)

With regard to mental causes, we see a considerable degree of analogy between their action on the tonicity of vessels through the sensorium commune, and the operation of pressure on the brain, in producing paralytic relaxation of various muscles.

(LXXIX.)

There is, however, another analogy of a more obvious kind; which is the diminished contractility usually observable in muscles, after they have been long or violently stimulated to action.

(LXXX.)

On this principle, we may reasonably explain the disposition to excessive determinations of blood, which is so apt to follow violent or long continued increased impetus in certain parts, or the whole, of the sanguiferous system; such impetus having incapacitated the capillary vessels from that degree of vital contractility, which is necessary to the continuance of their healthy functions.

(LXXXI.)

Hence we find, that persons, who, during what is called health, have a preternaturally quick or strong pulse, are much more subject to all the diseases of excessive local determination than others, whose circulation is constitutionally more moderate.

(LXXXII.)

In such cases, the general increased impetus, though usually to be considered as an occasional or exciting cause, acts as a cause of predisposition.

From what has been said it seems to follow, that, whatever may be the causes of excitement, the state immediately constituting the disease in such cases, is the want of a due degree of tonicity in the capillaries immediately affected.

(LXXXIII.)

It is highly worthy of inquiry, through what media

the several causes of predisposition, already specified, operate in increasing the general or local momentum of the blood.

(LXXXIV.)

Here it is obvious,

First, that all of them, except indolence, immediately produce an increased action of the heart, and consequently, for the most part, an increased general momentum of blood.

Secondly, indolence and full living produce a tendency to general plethora, or fulness of blood.

(LXXXV.)

On the agency of the first of these causes, the explanation already given is sufficient to preclude the necessity of any farther enlargement.

(LXXXVI.)

The second state shews itself by the circumstances of the pulse, venous distention, general heat, and, frequently, obesity of the patient relatively to that of other persons of the same sex, age, and bulk.

(LXXXVII.)

Here it is necessary to decide in what sense the term Plethora is employed.

(LXXXVIII.)

If by it we understand merely a fulness of certain

vessels, the expression certainly cannot be considered as a term of distinction, since, during life and health, all the vessels, whether arteries or veins, are undoubtedly full of blood, that is, there is no interval between their coats, and the blood which they contain.

(LXXXIX.)

It seems, therefore, to apply only to the existence, in any vessel or vessels, of such a quantity of blood, as dilates it or them beyond the degree, which is usual in the same persons, or others of the same bulk, under other circumstances.

(XC.)

In the same sense, I understand the phrase, "fulness of blood," except where the context naturally authorizes another application.

(XCI.)

On this subject, much information might reasonably have been expected to accrue, from the experiments on the transfusion of blood from the vessels of various animals to those of others.

(XCII.)

Unfortunately, however, these experiments, dictated by the humoral pathology of the time, had chiefly in view the question, whether it might not be practicable to restore health and prolong life, by the substitution of pure blood, for what was supposed to

be crude or vitiated. They consequently afford little useful information.

(XCIII.)

It appears, however, that in the greater number of the instances, in which this experiment was made on persons labouring under disease, the progress of the malady was evidently accelerated.

(XCIV.)

In one or more other examples, where there was little or no previous disorder, inconvenience is said to have ensued; and, in one such example, in which a somewhat larger quantity of blood was infused, than that which was taken away, a fatal effect followed.

(XCV.)

In this last case, the result was phrenitis and bloody urine; circumstances which exemplify inflammation and hæmorrhage, two of the modifications of excessive sanguineous determination already specified.

(XCVI.)

Hence, so far as one example goes, is exhibited the tendency of a general state of plethora to produce local disease, through whatever steps that process may be effected.

(XCVII.)

When we consider the Sanguiferous System, not merely as a set of dead tubes, but as a living ma-

chine, having in itself powers of accommodation, whether morbific or salutary, to the relative situation, in which it is placed, we cannot wonder at all those circumstances of affection or action, which result from the influence of external agents, modified by those inherent powers.

(XCVIII.)

To these affections or actions, the blood itself seems to be a peculiar stimulus, whether we consider that stimulus as operating more remotely, through the brain, or more directly on the vascular system itself, through which it more or less constantly and immediately circulates.

(XCIX.)

Although, therefore, we have no evidence that the arterial system in any way actively contributes to the mechanical circulation of the blood in a state of health, or that, in a similar state, the capillaries exert any propulsive power ; yet there can be no doubt that if either of these systems, in any part, comes to be preternaturally distended with blood, they have, under certain circumstances, severally the power of contracting themselves to the healthy degree, and of thus expelling the superfluous blood, which circulated through them.

(C.)

If, then, we can suppose the dilating force to be increased, as it must be in proportion to the increased

quantity of blood which constitutes it, and a tonic reaction takes place in any part of the arterial system, so that the arteries of that part return to their usual diameter; it is evident that, the quantity of blood in the whole system remaining the same, certain other parts, or the whole remainder of the system, must have its capacity and quantity of blood proportionably augmented.

(CI.)

This condition, the velocity of the blood being given, implies an increased momentum in such dilated part or parts; and thus we may conceive a reason, why a state of plethora, produced by the various habits above-mentioned, may give occasion to local excessive determinations of blood, exclusively of any perceptible increased action of the heart.

(CII.)

Experiment indeed demonstrates, that the disposition to contraction in the larger arteries is not, under apparently similar circumstances, every where alike; so that they will contract unequally and suddenly, and, in this way, may be supposed to serve for a moment as hearts to particular parts of the capillaries.

(CIII.)

This we might suppose especially to happen to any part, in which the capillaries were peculiarly weak and unresisting; so that there should be the coincidence of increased contraction of the artery, with diminished contraction in the capillaries to which it led.

(CIV.)

In this theory there is some speciousness ; but the question is whether there be equal truth ; since, on the contrary, we find that all the larger discoverable arteries leading to parts either inflamed, or similarly disordered, are not only not contracted, but actually enlarged.

(CV.)

So also, in an experiment described in a former work, I found that where, either from a partial ligature, or from a natural cause, the area of an artery was considerably diminished, the pulse in the artery beyond that part, was so far from being stronger, that it was greatly enfeebled.

(CVI.)

Whether any alternate dilatation and contraction takes place in arteries preternaturally distended for the purpose of supplying inflamed parts, actual observation has not enabled me to decide.

(CVII.)

Neither can I elsewhere find any direct evidence of this fact, which seems to have been assumed on the analogy of the presumed dilatation and contraction of arteries in health, dependent on the systole and diastole of the left ventricle—an alternation, which, as I have already often had occasion to remark, ocular inspection proves to have no existence.

(CVIII.)

Since, however, in a carotid considerably dilated by a ligature of the corresponding carotid on the opposite side, no such alternate motion was perceivable, we have strong analogical reason for concluding, that no alternation of this kind occurs in arteries unusually distended in consequence of leading to inflamed parts.

(CIX.)

We therefore want better evidence than any which I am able to adduce, as to the cause of many simply local increased determinations of blood, arising under a plethoric state of the constitution; although the fact itself seems to have in its favour the concurrent testimony of medical practitioners.

(CX.)

It seems, however, as if the more immediate and ordinary influence of a certain degree of undue plethora were on the heart itself, which is thereby stimulated to increased action, and therefore is the great cause of an excessive momentum throughout the sanguiferous system, and, in the mode already explained, of an undue determination to certain parts of the system of the capillaries.

(CXI.)

What share an accidental, or habitual, plethora of any, or all, the veins, may have in producing an obstruction to the free evacuation of certain parts, or

the whole, of the arterial system, it is difficult to determine.

(CXII.)

The existence of a venous plethora or fulness is supposed to arise, accidentally, from various causes; and it is believed to exist, constitutionally, after a certain period of life, when the balance of the sanguiferous system is so changed, that the preponderance, which, at an earlier period, occurred in the magnitude of the arteries, is now transferred to the veins.

(DCXIII.)

This difference seems to be tolerably well ascertained from the actual inspection of the veins themselves in old persons, relatively to the same veins in young persons of the same bulk and degree of obesity.

(CXIV.)

Such a preponderance of the arterial system in early youth naturally grows out of the necessity of providing for the growth of the several parts of the animal frame; a function, which is the peculiar business of the arteries; while, at a more advanced period of life, after the growth of the body has been completed, these vessels are chiefly concerned in carrying on the blood for the purposes of secretion and excretion, and of supplying what the constitution is habitually losing by those processes.

(CXV.)

Hence, at that early stage of life, this system is proportionably larger, not only than the venous, but than itself after the perfect growth of the body. This may be easily seen by any one, who will measure the circumference of the Carotids and many other arteries in the infant, comparatively with those of the adult.

(CXVI.)

The functions of the venous system itself, and the specific share which it has in carrying on the circulation of the blood by its own inherent vital powers, seems to be as little understood as any process in the whole animal œconomy.

(CXVII.)

Hitherto, the process seems to have been considered as being under all circumstances, chiefly, if not wholly, mechanical; depending very little, if at all, on the propulsory power of the heart, but principally on the effects of lateral pressure, by the action of the muscles in respiration and voluntary motion, and by the alternate dilatation and contraction of the arteries, from the systole and diastole of the left ventricle.

(CXVIII.)

With regard to the last of these causes, it cannot exist at all, except under a mechanical compression of the arteries by the surrounding parts, and must

be nugatory for any important purposes of venous circulation.

(CXIX.)

That the former actions have their share in mechanically propelling the venous blood, seems tolerably well ascertained from the obvious tendency of the valves of the veins, and from the increase of circulation, and acceleration of breathing, which accompany all kinds of increased muscular exertion; while, on the other hand, the effect of rest is immediately to diminish both.

(CXX.)

For the first experimental proof of the specific effect of respiration on the circulation in the veins, we are indebted to the great Haller, who found that, while expiration filled those of the head, and the larger ones of the thorax and limbs, inspiration always emptied them. This effect he attributes to the ready passage of the blood by the pulmonary artery during the latter process, and the consequent facility, with which it is sent out of the right auricle, and the large veins which immediately supply it.

(CXXI.)

Whatever may be the cause, the fact is certain. I have observed it in the superficial veins of the abdomen, preternaturally distended by internal tumor; and it may at any time be seen in the internal jugular, during the operation of laying bare the carotid

artery; and often in thin females, even in the natural state of the external jugular veins.

(CXXII.)

With regard to the power of the veins to carry on the circulation, many persons before the time of Haller, as well as that physiologist himself, observed, that when certain of the vessels were tied, they emptied themselves between the heart and the ligature, except where they anastomosed with other veins, which continued to have a free passage for the blood from the heart.

(CXXIII.)

This fact seems to shew that veins have a self-contractile power.

(CXXIV.)

It would, however, as in the case of the arteries and capillaries, be highly rash to assign them an action of this kind in a state of health, because they are found to exert it during a state of disease.

(CXXV.)

To me it seems, that authors are far from attributing to the left ventricle of the heart a sufficient power in propelling the blood through the capillaries and veins, and some modern physiologists have rashly gone so far as to deny, that there is any transit whatever of blood globules from the arterial to the venous capillaries.

(CXXVI.)

That fact has, however, been so clearly proved by the concurrent testimony of credible writers, as not to admit of doubt. Of those who have seen with the microscope the complete chain of circulation may be mentioned Cooper,* Baker,† Hales,‡ Haller,‖ and Spallanzani;§ and in these instances, which have been in the foot of the frog, in the tails of the water newt and certain fish, as well as in certain other parts, the passage of not only one globule, but occasionally of several globules abreast, was distinctly observable.

(CXXVII.)

Haller often found the rapidity of the blood in the capillary veins as great as in the extremities of the corresponding arteries, from which they commenced; and, if it was usually less in the former than in the latter, it was, as might be expected, exactly in the inverse ratio of the capacity of the veins relatively to that of the arteries.**

* Appendix to Bidloo. The plate introduced into Cheselden's Anatomy.

†

‡ Hæmastatics, pages 66, 67.

‖ Memoires sur le Mouvement du Sang: Exper. 61, 62; also pages 80, 81.

§ Experiences sur la Circulation du Sang. 1 Dissert. Exper. 51, 52, et seq. 116, 121, 135, 138, also p. 255.

** Mouvement du Sang; p. 81, 82, 83.

(CXXVIII.)

This conclusion is however controverted by Spallanzani, who asserts that the blood flows with equal rapidity in all the minute veins as arteries;* although, at the same time, he admits that the former are more numerous than the latter,† and that, *è converso*, the rapidity of the blood is augmented in proportion as the smaller venous branches containing it are collected into larger trunks.‡

(CXXIX.)

How these apparent inconsistencies of Spallanzani are to be reconciled, it is not easy to decide. But, perhaps, they may arise from the difficulty, in these cases, of forming an accurate comparison of the velocities of the blood by the judgment only, unaided by any mechanical measure.

(CXXX.)

It should seem, however, that, under a due performance of the circulation, this rule of inverse proportion of velocity, relatively to quantity, must hold good throughout the whole sanguiferous system; since, exclusively of what is, from various causes, lost in transitu, the quantity of blood, which returns to the right auricle by the venæ cavæ, must be equal to that which is thrown from the left ventricle into the aorta.

* Sur la Circulation du Sang; p. 268, and corresponding experiments.

† Ibid.

‡ Page 258.

(CXXXI.)

Were not the propulsory power of the ventricle sufficient for the ordinary purposes of healthy circulation, how could that circulation so uniformly continue during sleep, when there is no alternate movement and rest of any muscles, except those of respiration ; and how, in asphyxia, happens it that the whole venous circulation is renewed, as soon as the action of the heart is restored, and no sooner ?

(CXXXII.)

The propulsory force of the heart during health is certainly much under-rated ; and from an observation of the weight on the foot, raised at each systole, when one knee crossed the other, Senac inferred the power necessary to produce that effect to be equivalent to 400lb. A force much less than this should seem fully sufficient to accomplish the entire round of circulation.

(CXXXIII.)

That the influence of the left ventricle is capable of reaching the smaller veins during both ordinary and languid circulation, appears from the miscroscopical observations on water-newts, green frogs, the incubated eggs of fowls, and tad-poles, by Spallanzani; who found, that, in innumerable veins, the venous blood was evidently accelerated during the systole of the ventricle, and retarded during the diastole.*

* Sur la Circulation du Sang, p. 254, 255. See also his Experiments there referred to.

(CXXXIV.)

Mr. Hunter also remarks, that blood taken from the veins, near the extremities, not unfrequently flows with alternate jets, as from arteries; an evident proof of a similar influence of the ventricle on vessels recently continued from the extremities of arteries.

(CXXXV.)

A still greater influence of the heart is shewn under certain circumstances of disease; for I have already stated my having, on various occasions of inflammation about the wrist, seen, from a puncture of the lancet in the cephalic vein of the same arm, the blood spring out in jets, as from a wound in an artery. And since, in one of those patients, in whom the same phænomenon occurred thrice, the cephalic vein was situated at least two inches from the brachial artery, and the jets were exactly synchronous with the pulse in the radial of the opposite arm, there can be no reasonable doubt, that each jet was the immediate effect of the accelerated wave of blood, propelled at each systole of the ventricle, through the capillaries and veins to the bend of the arm; that ventricle thus sensibly acting throughout nearly the whole circle on to the right auricle, without the smallest perceptible coagency of the arterial, capillary, or venous systems.

(CXXXVI.)

In the former volume of this work, I suggested the possibility, that the expansion and consequent vacuum

of the right auricle might have some share in producing a mechanical entrance of the blood from the venæ cavæ into that cavity; and to this source some persons might attribute the occasional jet of blood in the veins.

(CXXXVII.)

If, however, this cause exist at all, its influence must be very slight; since, first, although the auricle is well known to act after other parts of the heart have become quiescent, yet, in a great variety of cases, that cavity, in common with the others, is found empty of blood; and, secondly, because, conformably to the observations of Mr. HUNTER already quoted, the jet of blood is most perceptible the farther, in the course of circulation, the vein is from the heart. So also in the microscopical observations of SPALLANZANI on the water-newt, that author saw that the jet of venous blood, corresponding with the systole of the ventricle, diminished as the vein approached the heart.*

Although, therefore, some coincident powers, at which I have already hinted, may assist the venous circulation, there seems no just ground to doubt, that it is the left ventricle, which mainly effects the circulation of the blood throughout its entire course.

(CXXXVIII.)

It is worthy of remark, that many of those authors, who deny all influence of the heart or arteries on the venous circulation, yet attribute certain morbid effects,

* Dissert. I. Exp. LIX.

as hæmorrhages and serous effusions, to that very influence.

(CXXXIX.)

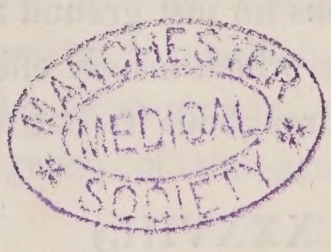
This conclusion is probably well founded; and the effort seems to be the natural, though, probably, not the most beneficial means, of removing that plethora, which occasioned it.

(CXL.)

We can easily conceive, that such a plethora in the veins, opposing a great resistance to the advance of the arterial blood, may stimulate the heart to a proportionably strong, sharp, or frequent action.

(CXLI.)

In this respect, the effect of the resistance to the free passage of the arterial blood bears some analogy to that which I have shewn to occur from making a ligature on an artery.



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